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SOME PROBLEMS IN THE EARLY DIAGNOSIS AND TREATMENT OF SARCOMA OF THE LONG BONES*

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FOR many years I have been especially interested in the study of sarcoma of the long bones, and have given considerable attention to the question of early diagnosis. Although much has been written on the subject during the last few years, there are still many important points unsettled, which must await the fuller knowledge derived from larger experience and more complete data.

By far the most illuminating discussion of this subject is that before the Royal Society of Medicine, in London, November, 1912. To this discussion Sir Alfred Pearce Gould, Sir Bland Sutton, Sir Frederick Eve, Mr. G. H. Makins, and several other surgeons and pathologists of note contributed the results of their large experience and broad knowledge. In addition most important new data were presented by Mr. G. E. Gask and Mr. R. C. Maybury.

Mr. Gask reported the results of the treatment of sarcoma of the long bones observed at St. Bartholomew's Hospital, from 1902 to 1911, a total of 61 cases, in carefully tabulated form, and Mr. Maybury gave a statistical report of long bone sarcoma cases at St. Thomas's Hospital, from 1901–1911, amounting to 45 in all.

The distribution of the St. Bartholomew cases is as follows:

	Male	Female	Total
Clavicle	0	2	2
Femur	18	7	25
Fibula	1	0	1
Humerus	7	1	8
Radius	2	0	2
Scapula	7	2	9
Tibia	10	4	14
Ulna	0	0	0

*Read before the American Surgical Association, April 8, 1914.

I can call attention only in the briefest way to the results. Of the femur cases, 25 in number, not a single patient with periosteal sarcoma was alive over three years after operation, and only one remained well eighteen months after. Of the myeloid type, 4 in number, 2 remained well over three years. Of the humerus cases, 8 in number, all were reported dead, not a single one reaching the three-year limit. Of the 2 radius cases, one died and one remained well over three years. The scapula cases were included in this list, although it seems to me hardly proper to do so; of these, 8 in all, one was well over 3 years, and the remainder had died. Of the tibia cases, periosteal type, 11 in number, one was well over five years, and of the myeloid type (3), one remained well over three years. In other words, of a total of 61 cases, only five passed the three-year limit, that is, 2 myeloid cases of the femur, 1 radius, and 2 tibia.

As regards the St. Thomas' Hospital statistics, there were 28 periosteal cases, and 17 myeloid. Of the former, 11 were not traced, 14 had died, 1 was well two years after operation, and not a single case passed the three-year limit. Of the 17 myeloid cases, without regard to the particular bone in which the disease originated, 8 were not traced, and of the remaining 9, 2 had died, and 5 remained well over three years. The latter 5 cases were all of the giant-celled type, and were located as follows:

One femur, giant-celled, well 9 years after amputation of the thigh.
One femur, giant-celled, well 7½ years after amputation of the thigh.
One femur, giant-celled, well 3¼ years after amputation of the thigh.
One femur, myeloid, well 3 years after operation.
One tibia, giant-celled, well 6 years after operation.

It is further worthy of note that not a single humerus case was cured by amputation. Apparently resection had not been employed in either hospital, even for the giant-celled or myeloid type. Grouping the statistics of the two hospitals together, of the 106 cases treated in both, only 10 had passed the three-year limit.

SYNOPSIS OF TABLES (1902–1911)

St. Bartholomew's Hospital		*Butlin's Collected Cases*	
Type	Well over 3 years	Type	Well over 3 years
Clavicle, 2	0	Clavicle, 7	0
Femur (periosteal), 21	0	Femur (periosteal), 68	1
Femur (myeloid), 5	3	Femur (myeloid), 46	5
Humerus (periosteal), 8	0	Humerus	0
Radius (myeloid), 2	1	Radius and ulna (myeloid), 16	6
Scapula (periosteal), 9	1	Scapula (periosteal), 25	1
Tibia (periosteal), 11	1	Tibia (periosteal), 35	1
Tibia (myeloid), 3	1	Tibia (myeloid), 52	9

The study of these interesting groups of cases treated at two of the leading hospitals in England shows that, with all the aids in recent years for reaching an early diagnosis, there is but little improvement over the gloomy statistics of Butlin a generation ago, the prognosis in periosteal sarcoma being practically hopeless in both series.

In conjunction with these cases, I would submit a brief analysis of my own cases, the results of which are considerably better than

those quoted above. This fact I am certain is not due to earlier diagnosis, as many of the cases were far advanced and inoperable when they were referred to me, but I believe the cause of the improvement must be looked for in the difference in the methods of treatment. This difference has consisted in the use of the mixed toxins of erysipelas and bacillus prodigiosus in a certain number of cases before amputation in the hope of saving the limb, and in other cases, immediately after amputation in the hope of preventing a recurrence.

PERSONAL CASES

Femur	60
Tibia	20
Fibula	5
Humerus	20
Radius	6
Ulna	4
Clavicle	6
Metacarpal	2
Metatarsal	1
Total	124

A RÉSUMÉ OF FINAL RESULTS

Inasmuch as my cases have been published more or less in detail in previous papers,[1] I shall at present give only a brief résumé of the successful cases.

CASE I.—*Spindle-celled sarcoma of tibia, periosteal.* W. F., male, age twenty-seven years; amputation had been advised. Entire disappearance of the tumor under four months' treatment with mixed toxins. Patient in good health to-day, sixteen years later, with perfectly normal limb. He was presented before the International Congress of Surgeons, at the General Memorial Hospital, on April 10, 1914.

CASE II.—*Periosteal round-celled sarcoma of the femur, involving two-thirds of the shaft; extensive metastases in the pectoral region.* A. G., male, nineteen years of age. Hip-joint amputation had been advised, but refused by the patient. Entire disappearance of the disease under two months' toxin treatment. The patient remained well for ten years, when he developed a very highly malignant tumor—sarcoma and epithelioma—at the site of an old X-ray burn in the skin of the thigh, which proved rapidly fatal. This case was reported fully in the ANNALS OF SURGERY, July, 1913, and *Trans. Am. Surg. Assn.*, 1913.

[1] Sarcoma of the Long Bones, with Report of 68 Cases, ANNALS OF SURGERY, March, 1907; A Plea for more Conservative Treatment of Sarcoma of the Long Bones, Journal of the American Med. Assn., January 29, 1910; Le traitement conservatif de sarcoma des os longs, Extrait des Comptes Rendus du 24 Congres de l'Assn. Francaise de Chir., 1911.

CASE III.—*Sarcoma of the upper end of the femur, round-celled, giant-celled.* R. L., female, eighteen years of age. Spontaneous fracture; too far advanced for hip-joint amputation. Recovery under the mixed toxin treatment; patient in good health with sound limb, eight years later.

CASE IV.—*Sarcoma of the humerus, upper end, round-celled, central, with involvement of glenoid cavity.* A. C., female, thirty-one years of age. Too far advanced for shoulder-joint amputation. Incomplete operation, curetting, followed by prolonged toxin treatment, carried out by Dr. J. B. Blake, of Boston, under my direction. Patient well 14 years later.

CASE V.—*Sarcoma of the tibia, central, involving periosteum.* K. K., female, seventeen years of age. Rapid recurrence had followed three conservative operations. Under six months' treatment with the mixed toxins, combined with a short period of X-ray treatment, the patient entirely recovered without loss of leg. She is in good health at present, nine years later. She was shown by me at the General Memorial Hospital, before the International Congress of Surgery, April 10, 1914.

CASE VI.—*Periosteal round-celled sarcoma of the femur.* Male, fifty-eight years old (Dr. Williamson's case). Considered too far advanced for hip-joint amputation by Dr. Wm. J. Mayo, of Rochester, Minn., who advised the mixed toxin treatment, which was carried out by Dr. Williamson, of Grand Forks, N. D., under my direction. Entire disappearance; limb saved; patient perfectly well at present, five years later. Microscopical examination made at the State Laboratory of North Dakota.

CASE VII.—*Sarcoma of femur, central, not giant-celled, involving periosteum.* J. P. W., male, thirty-five years of age. Amputation below trochanter by Dr. Erdmann; toxins given for four months after operation. Patient well at present, nine years later.

CASE VIII.—*Sarcoma of the lower end of the femur, mixed-celled, involving periosteum.* S. D., female, eighteen years old. Amputation below trochanter, followed by five months' toxin treatment. Patient in good health when last observed, six years later.

CASE IX.—*Sarcoma of radius, periosteal; pathologic fracture.* L. M. L., female, thirty-one years of age. Amputation; toxins for three months after operation; well at present, six years later.

CASE X.—*Sarcoma of the radius, central origin, giant-celled; pathologic fracture.* M. F., female, twenty-six years of age. Amputation advised by two surgeons; refused by patient; curettage followed by toxins for six months; disappearance of tumor; patient well at present, six years later.

CASE XI.—*Sarcoma of femur, periosteal.* C. L., female, aged thirteen years. Toxins for four months after operation; patient remained well for three years, then developed pulmonary metastases, causing death six months later.

CASE XII.—*Sarcoma of the lower end of the radius, round-celled; rapid growth; pathologic fracture.* F. S., female, aged twenty-five years. Curettage; followed by toxins for six weeks. Entire disappearance of the tumor; patient well when last heard from, two years later.

CASE XIII.—*Sarcoma of femur; central origin, mixed round- and*

spindle-celled, involving entire lower end of femur. Amputation; toxins for nearly a year after amputation. Patient in good health at present, nearly six years later.

CASE XIV.—*Sarcoma of ulna, round-celled.* I., male, fifteen years old (Case of Dr. Robt. W. Lovett, of Boston). Toxins given for four months after amputation of arm; patient in good health four years later.

CASE XV.—*Sarcoma of femur, round-celled, periosteal* (Case of Dr. Willmuth, of Louisville, Ky.). Almost complete disappearance of tumor under the toxins treatment; restoration of health; patient well when last observed, 18 months after treatment, which was carried out by Dr. Willmuth, under my direction.

CASE XVI.—*Sarcoma of clavicle, round-celled, periosteal.* Very rapid growth; total excision of clavicle; followed by toxins for four months; patient remained well five years.

CASE XVII.—*Sarcoma of clavicle, round-celled, periosteal.* Total excision; toxins given for a period of eight months. Patient well at present, six years later.

CASE XVIII.—*Sarcoma of humerus, periosteal, round-celled; metastatic, after amputation of leg for tibial sarcoma.* R. G. H., male, forty-six years. Amputation of shoulder-joint by Dr. Brackett, of Boston, followed by toxin treatment for four months. He remained well for two years; then developed metastases in the spine, for which a laminectomy was done, which he did not survive.

CASE XIX.—*Sarcoma of the metatarsal bone, periosteal, small, round-celled, of rapid growth.* F. K., female, sixteen years. Amputation of lower third of leg; toxins for six months. Patient well when last heard from ten years later.

CASE XX.—*Sarcoma of femur, periosteal, round-celled; involving upper third of shaft of leg.* C. M., male, thirty-five years. Rapid growth. Toxins given for four months, and while the growth was checked, the tumor did not disappear. Amputation at the hip-joint later performed by another surgeon. Patient well when last heard from one year after amputation.

CASE XXI.—*Sarcoma of lower end of femur, round-celled, of central origin, involving the popliteal space.* A. J. McC., male, forty-one years. Toxins administered for eight months, with decrease in size of tumor; improvement in function of leg, and general condition of patient. He then developed an infection of the sinus, resulting from exploratory incision, necessitating immediate amputation. Patient is well at present, over three years later.

CASE XXII.—*Round-celled sarcoma of lower end of femur, involving the popliteal space; central origin.* C. H. S., male, forty-seven years. Toxins given for nine months with decrease in size of tumor, and improvement in patient's general health. He then had a sudden hemorrhage resulting from a ruptured blood-vessel, necessitating immediate amputation. Patient recovered and is still well three years later.

CASE XXIII.—*Sarcoma of fibula, periosteal.* M. F., female, thirty-eight years. Toxins for several weeks before amputation; no appreciable

effect, therefore amputation followed by toxin treatment. Patient well at present, two years later.

CASE XXIV.—*Periosteal sarcoma of right femur.* G. M., female, twenty-seven years. Amputation advised but refused by patient. Tumor practically disappeared under six weeks' toxin treatment. Patient returned home and tumor again increased in size. Under larger doses and prolonged treatment, the disease was finally controlled, and the patient is well at present, two years later.

CASE XXV.—*Spindle-celled sarcoma of humerus, periosteal; rapid growth; pathological fracture; believed to be entirely beyond amputation.* F. L., male, thirty-five years. Apparent complete disappearance under five months' toxin treatment, firm reunion of arm. Recurrence necessitating shoulder-joint amputation. Later again followed by recurrence in pectoral muscle. Partial operation followed by toxin treatment. Patient in good health to-day, four years later.

CASE XXVI.—*Sarcoma of upper end of tibia, central.* C. M. R., female, sixteen years. Conservative operation followed by prolonged toxin treatment. Patient in perfect health four years later.

CASE XXVII.—*Very large myxosarcoma, chondrosarcoma of femur, periosteal.* H. P., male, twenty-seven years. Amputation at the hip-joint followed by three months' toxin treatment. Patient in excellent health to-day, two years later.

CASES IN WHICH TOXINS WERE NOT USED

CASE XXVIII.—*Myeloid, round-celled, giant-celled sarcoma of lower third of radius.* C. H., female, twenty-nine years. Two conservative operations by Dr. Hibbs, first in 1900; second January, 1902; amputation advised by several surgeons but refused; patient well when last heard from eight years later.

CASE XXIX.—*Sarcoma of tibia, upper end; central origin.* S. L., female, twenty-four years. Amputation below lower third of thigh. Patient well when last heard from ten years later.

CASE XXX.—*Sarcoma of upper end of tibia, giant-celled; central origin.* E. W., female, twenty-six years. Amputation by Dr. Bull below third of thigh. Patient well seven years when metastasis occurred in the lung. Death six months thereafter.

CASE XXXI.—*Sarcoma of lower end of femur; central, giant-celled.* C. C. S., male, forty-two years. Amputation advised but refused. Curetted. Patient in good health two years later without recurrence.

The limb was saved by the preliminary use of toxins in 11 cases. I cannot, therefore, too strongly urge such preliminary toxin treatment. The few weeks needed to determine the question as to whether the toxins will be of value in the given case is not connected with any appreciable risk, and if it is possible to save the limb in such a considerable number of cases, it is certainly worth this trial; even if the toxins fail to completely control the tumor and it is found necessary subsequently to resort to amputation, the preliminary use of the

toxins has unquestionably had a modifying effect upon the malignancy of the tumor, in a number of cases at least, as shown by one of my own cases, a very far advanced periosteal sarcoma involving the middle and upper thirds of the femur,—which I regarded beyond hip-joint amputation. At the end of four months' treatment the growth had been practically entirely inhibited, spontaneous fracture followed and the leg was later amputated at the hip-joint by another surgeon. The patient was well 1½ years later, when last heard from. The case of Sir Frederick Eve is another case in point.

The foregoing summary shows 27 cases in which the toxins were used either before or after amputation or both.

Femur cases, 13; well from 1½ to 10 years; or 10 from 3–10 years. Eight of these were of periosteal origin, 5 of central (of the latter, 2 involved the periosteum).

Tibia cases, 3; well 4, 9 and 16 years respectively, of which 2 were of central, and 1 of periosteal origin. All of them were cured by a conservative operation followed by the toxins.

Radius cases, 3; of which 2 remained well six years, the other, 2 years. Two were of central, and one of periosteal origin. Two of the cases were cured by curettage followed by toxin treatment; in one the toxins were used after amputation.

Humerus cases, 3; two were of periosteal origin, and 1 of central. In one of these cases the arm was saved, the toxins being given after an incomplete operation. The patient remained well 14 years later. In the other two cases amputation had to be done, and they have remained well, 4 and 3 years respectively. The latter case finally had a recurrence in spine and died as the result of operation.

Ulna cases, 1; of periosteal origin. This patient received a course of toxin treatment after amputation of the arm, and has remained well for six years.

Fibula cases, 1; of periosteal origin. Amputation was done 2 years ago, followed by toxin treatment. Patient is well at present, two years later.

Metatarsal bone, 1; case of periosteal origin. The toxins were used as a prophylactic after amputation, and the patient was well when last heard from, ten years later.

Clavicle cases, 2; both of periosteal origin. In both cases, total excision was done, followed by a course of toxin treatment. One remained well five years, the other is still well and free from recurrence at present, 6 years later.

Twenty-one of the foregoing cases remained well from 3–16 years; 14 cases remained well from 5–11 years.

In 11 of the above 27 cases, the limb was saved by the use of the toxins, and 8 of these remained well from 3–16 years.

In 16 of the cases, the toxins were used as a prophylactic and in 5 of these they had been given before amputation as well.

It is important to note that my own series of cases differs from every other published series of cases, in that it represents a much larger num-

ber of advanced cases, in which the disease had progressed so far that the condition was inoperable and apparently practically hopeless at the time the patients came under my observation.

Diagnosis.—The early diagnosis of sarcoma of the long bones requires accurate clinical knowledge of all the conditions most likely to simulate sarcoma. Second, it requires a great amount of actual examination and careful clinical study of a large number of cases of sarcoma of the long bones. The tactile sense may be so educated by such experience that it has an inestimable value in making a diagnosis. A careful history of the case brings out important facts which long experience, combined with good judgment, will arrange in logical order, and give proper weight in arriving at the final diagnosis.

Clinical Diagnosis.—In a considerable proportion of my own cases, pain has been the first symptom of the disease, preceding the development of the tumor. Pain may vary in character, but it is usually a deep-seated, boring pain, worse at night, or after using the limb. After a tumor has developed to sufficient size to be palpable, there is generally the sign of local heat and in not a few instances there may be a general rise of temperature, up to 101–102°. One of my own cases, a boy of twelve, with a fusiform swelling in the middle of the femur, showed a daily rise of temperature to 100–101–101½°. This, with the local heat, caused the patient to be admitted on the diagnosis of periostitis. I made the diagnosis of periosteal sarcoma, which was confirmed by microscopical examination.

The locality of the tumor may be of considerable help in the diagnosis, particularly when making a differential diagnosis between sarcoma and tuberculosis. Sarcoma very rarely, in the early stages at least, involves the joint or synovial membrane. It may be differentiated from an exostosis or osteoma, by the fact that the latter is of slower growth, is usually without pain, is harder and more uniform as to consistence, and is very apt to be pedunculated.

Sir Alfred Pearce Gould attaches great importance to the globular expansion of the long bone, holding that:

"True expansion of the bone is a sign of the greatest importance, and the more limited the area of bone expanded, and the greater the degree of expansion, the more characteristic this sign, and the more likely is the tumor to be a myeloma rather than a sarcoma. The absence of new bone laid down on the surface of the enlarging bone is a striking distinction between a sarcomatous growth and a tuberculous, syphilitic, or inflammatory ostitis.

"I have already pointed out that in the case of central sarcoma in the earliest stage, only the X-ray can demonstrate its presence. But the increasing growth of a sarcoma is attended with other features that enable us to identify

it. In myeloma particularly we notice the globular outline of the tumor and its expansion of the bone into a similar globular form. In no other disease is the globular expansion of an epiphysis carried to such a degree; the swelling shows no tendency to extend along the shaft, and to involve more and more of the length of the bone. The cancellous bone is rapidly destroyed, and the outer shell of bone is truly expanded: there is no real thickening of the bone from new deposit on its outer surface. This is a striking contrast to the condition found in tuberculous or coccal infection of an epiphysis."

Sir Frederick Eve has advanced a theory which is original as far as I know. He asserts that the difference in the nature of myeloma and sarcoma depends rather upon the site of the disease than upon the structure of the tumor; the nearer the body, the greater the degree of malignancy would appear to be true of the myelomata as well as the periosteal sarcomata.

My own experience has not been in entire accord with this theory. One of the most malignant tumors that I have ever seen was a periosteal sarcoma of the metacarpal bone, and another a sarcoma of the lower end of the ulna.

Sir Frederick Eve further states that:

"Although it has long been taught that the true myeloma has a low degree of malignancy, yet it is only in recent years that it has been recognized as possessing, at least in some situations, a purely local malignancy. Butlin, even in 1900, classed the central round and spindle-celled sarcomas with the myelomata under the common heading of central tumors, in discussing their treatment. The broad general statement made in some text-books that the myelomata are only locally malignant required, however, considerable modification. The myelomata of the femur, and especially those of the upper end of the humerus, are sometimes followed by metastasis. According to Butlin's statistics, the tumors were giant-celled sarcoma in three out of five patients who died with metastasis after amputation of the femur for central sarcoma. And in two out of three unsuccessful cases of sarcoma of the upper end of the humerus two were described as myeloid sarcoma."

The question of the relative malignancy of myeloid sarcoma is one that is still far from settled. The opinion held by Bloodgood and others is that giant-celled sarcomas are practically benign, and furthermore, that they never give rise to metastasis. It is evident that the different writers who took part in the Royal Society of Medicine discussion of this question, approached it from different points of view. Some include in this type of myeloid sarcoma, all endosteal sarcomas, some of which latter are of high malignancy, while others limit the term to small encapsulated endosteal tumors of slow growth, made up almost entirely of giant-cells.

I agree with Mr. Gilbert Scott, of London, who, in the discussion,

stated that although myeloid sarcomas are usually of slow growth, they may also be just as rapid in growth, and as fatal, as true endosteal sarcoma. At any rate, in my own personal experience in a number of cases in which the pathologist's report stated that it was a giant-celled tumor of the epulis type, the disease ran a clinical course of extreme malignancy, causing the death of the patient within a few months and often associated with metastasis. Histologically there is apparently no difference between this type of tumor and the slow-growing epulis of the jaw.

With regard to the question as to whether these myeloid or giant-celled endosteal tumors ever produce metastasis, opposite opinions are held. Maybury cites two cases of myeloid sarcoma, observed at St. Thomas' Hospital, in both of which the patient died of small deposits in the lung. Case I: Girl, sixteen years of age; with sarcoma of the femur of three months' duration; exploratory operation and microscopical examination. Amputation done; metastasis of the lung 7 months later, causing death. Case II: Disease occurred in the bone; amputation; metastasis of lung; death eight months later. Slides of both of these cases were presented at the discussion of the Royal Society of Medicine and were pronounced typical specimens of giant-celled sarcoma.

Following are the results of the 4 cases of sarcoma of cartilage, treated at St. Thomas' Hospital: 1 not traced; 1 died 2½ years after operation; 1 died 5 years after operation; 1 alive 2 years and 7 months after operation.

My own cases strongly support the view held by Mr. Maybury, on the subject.

The following personal case I believe to be worthy of a detailed report, inasmuch as it has an important bearing upon the question of the malignancy of myeloid or giant-celled tumors, about which there is such great difference of opinion here and abroad.

Sarcoma of the Humerus.—H. B., male, ten years of age, was referred to me on March 16, 1910, by Dr. Bellis, of Trenton, N. J., with the following history: Had a fall upon the ice five weeks before, striking upon his left shoulder and upper arm. He could not use the arm after the fall and was seen by a physician who found loss of power and evidence of fracture at the junction of middle and upper third of humerus. He was put in a plaster case. Three weeks later, or two weeks before I saw him, on removal of the splint, a tumor of considerable size was found at the point of fracture. This was regarded at first as redundant callus. It was watched for a week, at the end of which time it had markedly increased in size. The patient was then seen by Dr. Bellis, who found a large tumor

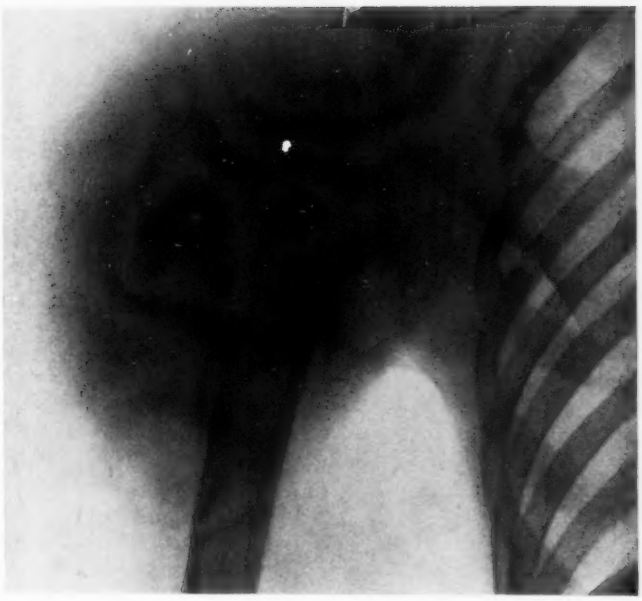

FIG. 1.—H. B. Sarcoma of humerus, periosteal. Interscapulothoracic amputation. Tumor of only five weeks' duration.

FIG. 2.—H. B. Sarcoma of humerus. Microscopic examination, giant-celled epulis type. Death from lung metastasis in one year.

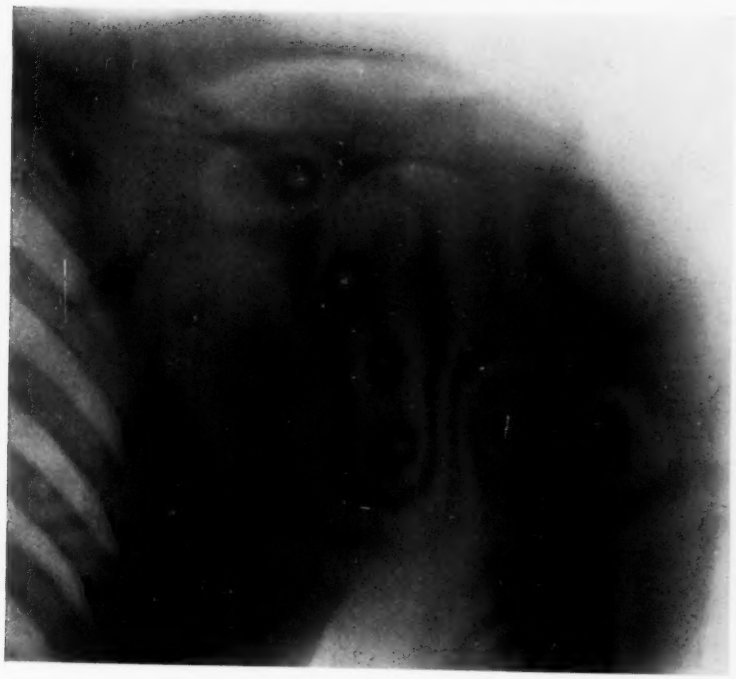

FIG. 3.—R. F. Sarcoma of humerus, periosteal.

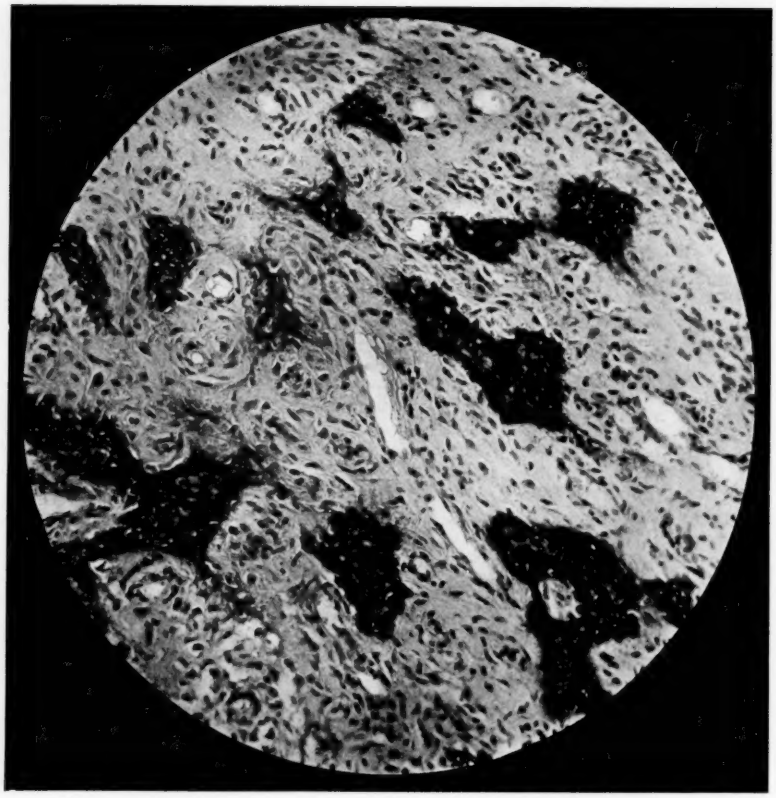

FIG. 4.—R. F. Microscopic report, osteoid medullary giant-celled sarcoma of humerus, very malignant. Metastasis shortly after amputation.

in the upper third of the humerus, enlarged veins, having the typical appearance of a sarcoma. The tumor increased rapidly in size and a week later, March 16, 1910, Dr. Bellis referred the patient to me. Physical examination at this time shows the left humerus enormously enlarged, measurements being 12⅝, 13⅞ and 14½ against 7⅞, 10 and 11½ inches on the opposite side. All superficial veins were greatly enlarged and bluish in appearance. The tumor extended beneath the pectoral muscle to the middle of the clavicle, and posteriorly to the edge of the scapula. Some glands could be felt in the axilla. There was very little loss of weight. The X-ray showed what I believed to be the typical appearance of sarcoma. Without waiting for a pathological confirmation of the diagnosis which seemed to be perfectly clear, and in view of the apparent high degree of malignancy of the disease as evidenced by its rapid growth, I believed it unsafe and unwise to do an exploratory operation, and determined to amputate at once, which I did at the shoulder-joint. The patient made a satisfactory recovery from the operation and was put upon small doses of the mixed toxins, which were continued twice a week by his local physician for about two months; then once a week for another two months. The report of the microscopical examination made by Dr. Jas. Ewing, Professor of Pathology at Cornell University, reads as follows:

(March 21, 1910.) "The process in the humerus proves to belong in the class of giant-celled sarcoma. It consists of wide blood-space surrounded by thin strands of loose cellular tissue composed of spindle-cells. The spaces are partly lined by giant-cells and some few giant-cells are found within the strands of tumor tissue. By far the larger part of the bulk of the tumor is made up of blood spaces. The tumor has exactly the structure of the giant-cell epulis, and I think, therefore, that it has the same moderate degree of malignancy."

From the histological appearance of the tumor, Dr. Ewing was so impressed with its low grade of malignancy, that he believed that I had been in error in doing such a radical operation, since he had seen a similar case which had been cured by curetting.

The subsequent history of the case is of interest:

December 26, 1910, Dr. Young writes: "The boy is in excellent health, and shows no sign of any trouble."

May 31, 1911, I examined the patient personally and found he had a slight cough, no loss of weight and no physical signs of a recurrence. Soon after he began to show great lassitude, general malaise and less ability to bear exercise.

June 30, 1911, physical examination by myself showed very marked dulness in the right apex, shortness of breath; slight hacking cough.

The clinical signs in the chest increased, the patient's general condition rapidly deteriorated and he died on August 20, 1911, fifteen months after the operation.

It is but fair to say that on later examination of the specimen by Dr. Ewing, he inclined to the belief that the tumor in question belonged to the rare type of bone aneurism of a very high degree of malignancy, rather than to the epulis or giant-cell type.

If this be true, it only goes to show that the two types of tumor may so closely resemble each other that the most expert pathologists with the widest experience are not always able to distinguish them.

In connection with the generally supposed benign character of giant-celled sarcoma, I would further mention the following case observed at the General Memorial Hospital two years ago, on the service of Dr. Chas. N. Dowd:

Male, twelve years of age. Tumor of the lower jaw. Microscopical examination showed it to be a myeloid sarcoma of the epulis type, supposed to be of very benign character. In spite of operation, it recurred promptly and grew with great rapidity, causing death within four months.

I had a very similar case four years ago, of a tumor occurring in a young woman eighteen years of age. Patient went to the Thirty-third Street Hospital, where, under ether anæsthesia, Dr. Downes and I removed a large portion of the tumor, which was easily extirpated by curette and large spoon. Microscopical examination was made by Dr. James Ewing, who pronounced the disease myeloid sarcoma of the epulis type. The patient was put upon the mixed toxins, but the tumor grew so rapidly that it was thought inadvisable to continue the treatment. The patient steadily grew worse and died about a month later. In this case the total duration of life was four months from the time the tumor was first noticed.

Sarcoma of Right Humerus.—Very highly malignant yet microscopically of the epulis type. R. F., fourteen years of age; no history of tuberculosis or cancer in family. Patient had always been in good health until June, 1911, when she noticed pain in the upper part of the left shoulder, followed shortly by noticeable enlargement; the swelling increased in size and the pain continued. She was brought to me by her family physician, Dr. L. I. Mason, of Willimantic, Conn., on September 21, 1911. From the clinical appearance of the tumor combined with the X-ray, I made the diagnosis of periosteal sarcoma. Without any exploratory operation, I decided upon immediate amputation, which was done on August 23 at the General Memorial Hospital. The tumor was examined by both Dr. W. E. Clark, pathologist at the General Memorial Hospital, and by Dr. Jas. Ewing, professor of pathology at Cornell University Medical School.

The former reported:

"Biceps tendon undergoing degeneration, edge of specimen contains small amount of tumor tissue."

Dr. Ewing's report reads:

"The tumor is a mixed type of giant- and spindle-cells of the epulis variety."

The mixed toxins were begun on September 6, the injections being made in the pectoral region. She received four treatments while in the hospital, the largest dose being 2 minims which was followed by a chill and temperature of 101°. On October 16, went home to have the treatment continued, but her condition grew worse so rapidly only two

small doses were given. On September 25, Dr. Mason noticed a slight recurrence. The wound had not yet entirely healed and there was a recurrent mass, half an inch in diameter, appearing in the scar. This increased rapidly in size despite the toxin treatment which had been resumed. The patient's general condition markedly deteriorated and the toxins were discontinued. The recurrent tumor grew with phenomenal rapidity and the patient died on October 28, a little over two months after amputation, or three months after the first signs of the disease were noticed.

The X-Ray in Diagnosis.—While the X-ray may often be misleading in the early stage of sarcoma of the long bones, it may also be of valuable help in making an early diagnosis. In order properly to estimate its value, large experience in interpreting X-ray photographs is required. In periosteal sarcoma we may have lesions that closely simulate sarcoma, especially in the non-ossifying type, in which no new bone is developed, the old bone being eroded or partially destroyed. Tuberculosis, syphilis, and chronic osteitis may simulate this condition. The X-ray is of very great help in such cases. Here we have a tendency of new bone to form spicules which stand out or radiate at right angles to the shaft of the bone, and in the opinion of many authorities, this particular arrangement is characteristic of sarcoma. I would not go quite so far as to endorse this, as there are important exceptions to this rule, *e.g.*, Appel case.

The X-ray shows little or no difference between a sarcoma of the shaft of the bone and a carcinoma of the bone secondary to primary carcinoma elsewhere in the body. The clinical history should settle this point. In endosteal tumors, the X-ray may not enable one to differentiate between a bone cyst and a central sarcoma, but the clinical history may often help to make a differential diagnosis.

The following case shows that the sharply defined periosteal line, which can usually be relied upon as an important diagnostic sign in the differential diagnosis between myositis ossificans and periosteal sarcoma, occasionally fails.

H. W., female, eighteen years old; entered my service at the General Memorial Hospital, in June, 1910, with the following history:

She had noticed pain or a drawing sensation at the junction of the middle and lower thirds of the right thigh for 3–4 weeks. The pain gradually increased and a little later a swelling could be detected in this region. There was no history of injury. Physical examination showed a fusiform enlargement at the junction of middle and lower thirds of right thigh, apparently connected with the bone, of moderately hard consistence and not tender. The skin was slightly reddened from external applications which had been made at one of the large surgical clinics for two weeks, on the supposition that the trouble was of inflammatory character. I had an

X-ray photograph taken which showed a slight fusiform enlargement in the lower third of the femur and a clearly defined, apparently normal periosteal line, quite as well defined as one sees in myositis ossificans, with none of the indentations or erosions so characteristic of sarcoma of the femur in its early stages. In the absence of any previous injury, I made the diagnosis of sarcoma of the femur, which was confirmed by microscopical examination of a portion of the tumor removed by exploratory operation. The patient refused amputation as well as further toxin treatment. Later history of the case unknown.

The following two cases, for the histories of which I am indebted to my colleague, Dr. Wm. A. Downes, show the importance of repeated or serial X-ray examinations in the early stages, when the diagnosis is in doubt.

CASE I.—A. G., male, thirty-six years of age; admitted to St. Luke's Hospital on July 18, 1913. Family history, negative; personal history: Seven months before, patient had fallen upon his hip. He returned to work after a few days, although he had local pain, which was attributed to rheumatism. He consulted the Out-patient Department of St. Luke's Hospital, and was told that he had hip trouble. A month before his admission to St. Luke's Hospital, he had stayed at the J. Hood Wright Hospital for seven days, where the diagnosis of tuberculous hip-joint was made. During the entire time the patient had severe pains, starting in the hip and radiating down the leg. These pains were more severe at night. The first X-ray plate taken at St. Luke's Hospital, shortly after his admission, on July 18, 1913, showed nothing characteristic of sarcoma; one taken later showed distinct changes in the outline of the bone and evidence of new growths. At this time an exploratory operation was done and the pathological diagnosis of fibrosarcoma of the femur made. The disease was then too extensive for hip-joint amputation. The tumor grew very rapidly and the patient died.

CASE II.—*Central sarcoma of lower end of femur and popliteal region.* S. F., female, sixteen years; admitted to St. Luke's Hospital on August 28, 1913, discharged December 5, 1913. Tuberculosis in family. Personal history: Two months before admission the patient noticed a slight stiffness about the knee, which gradually increased and was accompanied by some swelling; walking became more and more difficult; no redness about the joint, although at times there was some tenderness and local heat. No history of antecedent trauma, except that her foot was hurt in an elevator 1½ years before. The first X-ray plate taken showed practically nothing abnormal. Three weeks later, a second X-ray taken in the same position showed a distinct enlargement, very characteristic of sarcoma. Dr. Downes then immediately amputated at the hip-joint. The patient is well at the present time.

The difficulty in making an early diagnosis in many cases of sarcoma of the long bones is illustrated by the following case:

Sarcoma of Humerus.—S. E., twenty-three years of age, male, was thrown from a horse in July, 1912, sustaining abrasions on the face and right elbow, and a severe shaking up. In the latter part of August he noticed pain in the right shoulder, directly over the head of the humerus and acromion process of the scapula. X-ray examination proved negative. He showed some improvement under local application of heat. In October, another X-ray was taken and showed a rarefying osteitis. The trouble was regarded by the attending physicians and consultants as probably a tuberculous joint. One month later he began to have attacks of indigestion; at the same time the shouider became tender and somewhat swollen. The patient was examined by prominent specialists in orthopædic surgery and internal medicine, but no diagnosis could be made until the middle of December, 1912, when an enlarged gland appeared beneath the pectoral muscle near the head of the humerus. This was removed and pronounced round-celled sarcoma at the Bender and Harvard laboratories. The patient's general condition rapidly deteriorated; he became greatly emaciated and suffered very severe pain. The toxins were begun on December 20 and continued for two weeks, at the end of which time I saw him in consultation. I found him in such an extremely emaciated condition, with such a weak, rapid pulse, that I advised against further treatment. He died a few weeks later. At the time of my examination there was a large tumor of the upper end of the humerus, apparently involving the entire circumference of the humerus with probable extension into the scapula.

In this case, though the patient had the advantage of very early X-ray examinations and consultation with leading specialists in surgery and medicine, no diagnosis was made until metastases had occurred and the patient was far beyond help. In this case and in many others I suspect we do not lay sufficient stress upon persistent, severe and localized pain.

In a very considerable number of my cases this kind of pain has been a pronounced feature in the earlier stages of the disease yet it has merely served to render the diagnosis of rheumatism acceptable to the patient and his friends and has not aroused the suspicion it should that the trouble in question might be sarcoma.

EXPLORATORY OPERATION AND MICROSCOPICAL EXAMINATION OF SPECIMEN REMOVED: ADVANTAGES AND DISADVANTAGES

Advantages.—That the removal of a portion of a tumor and the report upon its histological structure by a competent pathologist is of the greatest advantage cannot be questioned, and under ordinary conditions, I believe, we should avail ourselves of this aid.

Disadvantages.—There are, however, very definite and weighty objections to the exploratory operation in sarcoma of the long bones

which, in the opinion of many very high authorities, notably Mr. Ballance and Mr. Makins, of London, may equal or exceed its advantages.

a. There is the danger that the mere cutting into the tumor, particularly a vascular round-celled sarcoma, may set free tumor cells which, entering the circulation, become carried to remote parts of the body, and give rise to early metastases. A number of cases have been cited, that furnish convincing evidence that such a result has occasionally followed exploratory operation.

b. There is the objection that the exploratory operation may do permanent damage in the way of causing sinuses that do not heal and which may become infected and later give rise to serious conditions, as seen in two of my own cases.

c. The last, but by no means least important, disadvantage is the risk that the exploratory incision, by reason either of not having been carried deeply enough, or by not happening to include a sufficiently characteristic portion of the tumor, necessarily leads to a negative report from the pathologist. With such a negative report on the one hand, yet with the clinical and X-ray data, on the other hand, strongly pointing to sarcoma, the surgeon is placed in a very difficult position.

While many surgeons advise exploratory operation as a routine measure in all cases of sarcoma of the long bones and others are so impressed with its disadvantages and risk that they seldom or never resort to it, my own experience has led me to adopt a middle ground, which may be briefly stated as follows:

In cases in which the history and clinical signs are very strongly positive, I would not subject the patient to the risk of an exploratory operation, but would proceed immediately to perform the operation which seems best adapted to the individual case. I have on two occasions performed total excision of the clavicle for a rapidly growing periosteal tumor of only three weeks' duration. In both cases the clinical appearance of the tumor, confirmed by the X-ray picture, together with a history of the tumor having appeared almost immediately after an injury, made the clinical diagnosis so strongly positive, that it seemed unwise to submit the patient to the risk of exploration.

Another case which I recall was that of a very large tumor of the upper end of the humerus, immediately following a fracture. The tumor had attained this large size in the short period of three weeks. It was associated with enlarged veins, and the X-ray gave a typical picture of sarcoma. I believed that cutting into such a vascular tumor

as this for the sake of verifying the diagnosis which seemed practically certain without such evidence, was unjustifiable. It might be urged, on the other hand, that in such cases an examination of a frozen section should be made at the time of operation, before any radical operation was performed.

To this I would reply that, in my opinion, the clinical history of the case and the macroscopical appearance of the tumor to one who has had a large experience in sarcoma, is of much greater value than the microscopical examination made from a frozen section. In the humerus case which I have just cited, the examination from the frozen section or exploratory operation would have been a distinct disadvantage, for the pathological report made on the basis of an examination of the entire tumor, pronounced it giant-celled sarcoma of the epulis type, and the pathologist stated that he believed amputation was not indicated, and that the disease could have been cured by curetting alone. Having nothing but the clinical evidence to go by, I did a shoulder-joint amputation. The patient made a good recovery, but in spite of a brief period of toxin treatment following the operation, within nine months, extensive metastasis occurred in the lungs and the patient died a few months later.

Furthermore, I would not make use of an exploratory operation in another group of cases, in which, though the clinical evidence is less strong and positive than in the preceding group of cases, the anatomical location of the tumor is such as to render probable a hemorrhage that might be difficult to control, or an even greater probability of a resulting sinus, difficult or impossible to heal. I would never again explore a probably sarcomatous tumor located in the lower end of the femur, situated behind the popliteal space, as I did in two cases already reported (ANNALS OF SURGERY, March, 1913, Myositis Ossificans).

My experience in the two cases which I have cited has convinced me of the disadvantages of exploratory operation in such cases. The better plan in this group of cases in my opinion would be to assume the diagnosis of sarcoma to be correct, in the absence of tubercular signs and with a negative Wassermann reaction, and to give the patient a brief course of treatment with the mixed toxins. During this treatment the clinical signs and measurements should be confirmed by a series of X-ray pictures taken at short intervals, *e.g.*, every 2–3 weeks. If it becomes evident that the disease is progressing, one can then resort to an operation, not merely an exploration, but such an operation as seems best adapted to the particular case, curetting, resection or amputation.

Before ever resorting to amputation, I would first cut into the tumor. The gross appearance would, in the great majority of cases, be sufficient to establish the diagnosis beyond question. But, if there were still doubt, a frozen section could be made, or, in my opinion, a better procedure would be to remove sufficient material for a thorough examination, close the wound and defer the final operation until a careful histological examination, by a competent pathologist, can be made. Cases in which this latter procedure becomes necessary should be extremely few in number.

Cases in which Exploratory Operation is Indicated.—(1) Cases of sarcoma of the upper end of the tibia, or lower end of the radius, in which it is most important to know whether we are dealing with a mixed-celled or highly malignant sarcoma, or a giant-celled or myeloid type of sarcoma, of a lower degree of malignancy. The type of tumor in this case would determine largely whether it was necessary to sacrifice the limb, or whether one could be content with a conservative operation to be followed by a course of toxin treatment.

(2) The exploratory operation is indicated in periosteal sarcoma of both the shaft and the extremities of the long bones, especially in the early stages. Here, I do not believe we run a great risk of causing dissemination, and my experience has been that the sinuses following the operation heal much more readily than in the more deeply seated or central sarcomas. In addition, the risk of hemorrhage is not nearly so great. The principal disadvantage is that the miscroscopical examination may be negative. In cases in which we are still in doubt, we must determine on other and clinical grounds whether to operate or wait. One of my cases of myositis ossificans, reported before the New York Surgical Society at its meeting on December 11, 1912,[2] shows that it is not always easy to do the right thing, with all possible data at our command and all known aids to early diagnosis. In certain cases we are bound sometimes to fail. In spite of the disastrous ending in this particular case, I feel the proper course was pursued, at least at the time of the first exploratory operation, and I further believe, we were justified in delaying amputation after such a strong negative report of the pathologist's upon the material removed at an extensive exploratory operation. How long one should wait, is another question and can never be answered in general terms. With clinical signs of increase in size plus the characteristic appearance of a periosteal sarcoma shown in a skiagram, I am now convinced that in some cases, at least, one is justified in

[2] Annals of Surg., March, 1913.

FIG. 5.—Osteomalacia. All long bones involved. (Courtesy of Dr. Gibney and Dr. Darling.)

FIG. 6.—F. C. Microscopic examination, (1) chondrosarcoma, one report, (2) myositis ossificans, another report.

sacrificing the limb, even in the face of a negative pathological report.

With regard to the difficulties and uncertainties of exploratory incision, Elmsley cites the following cases illustrating the point (*Royal Soc. of Medicine,* November, 1912, Discussion):

In the Museum at St. Batholomew's there are two specimens of very great interest and importance. Each was a femur containing a patch of necrosis, and a large mass of inflammatory new periosteal bone around. Each of them was amputated under the impression that it was sarcoma, after exploratory incision into the tumor. They occurred before the days of skiagraphy; nowadays, no doubt, a good skiagram would lead to the correct diagnosis being made. In these two cases the exploratory incision failed because it was not carried deep enough. He believed that the majority of mistakes and failures after exploratory incision were due to the surgeon not cutting deep enough, or else not cutting into the right part. One such case occurred to him.

Mr. Makins (*loc. cit.*) does not agree with Sir Frederic Eve in the opinion that the dangers of cutting into a sarcoma have been overrated. He cites cases in his own experience which convinced him that such exploratory operations sometimes cause a rapid generalization of the disease. The present custom is, never to cut into a sarcoma of the long bones unless prepared to amputate within 24 hours.

The following personal case illustrates well the difficulties that sometimes confront the clinician, when he has received two diametrically opposite or strongly conflicting reports from different pathologists.

F. C., male, seventeen years of age, son of a prominent surgeon in western New York State, had noticed a tumor at about the centre of the biceps muscle of the right arm for a period of 2–3 weeks. The father of the boy, who removed the tumor, gave the following history:

(January 24, 1914.) "The tumor was firmly imbedded and adherent to the muscle, extending nearly to its outer surface and running clear through the muscle and attached to the periosteum, but not firmly attached. There was no encapsulation, the muscle fibres being directly adherent to the growth itself."

The patient had suffered no pain. Family history was negative. A portion of the tumor was submitted to three different pathologists; one, a pathologist of wide experience, stated that it was a chondro-osteosarcoma. The second stated that it was not malignant, at least only in a small degree. The third report, made by a distinguished professor of pathology in one of the leading medical schools in the country, read as follows:

"Sections of the tissues from the biceps in the case of F. C. show a picture, which I interpret as myositis ossificans.

"The muscle tissue is the seat of extensive fibrosis and in the centre of this fibrous area there are numerous actively forming bony trabeculæ. The type of bone formed is over cellular and there are mixtures with cartilage. Quite a few giant-cells are found in some areas, but nowhere is the picture that of straight-forward sarcoma.

"Nevertheless, I feel that some traumatic sarcomas start in this way;

yet the sarcomas are sarcomatous from the start, and this is not sarcoma."

I was asked for an opinion as to the best course to pursue. In view of my unfortunate experience with the case of myositis ossificans of the lower end of the femur, quoted in full in the ANNALS OF SURGERY, March, 1913, p. 307 (Miss A.) [3]—in which a highly malignant sarcoma eventually developed, followed by early metastases and death—I believed it wise to act on the supposition of a possible sarcoma in this case and, therefore, put the patient upon prophylactic doses of the mixed toxins of erysipelas and bacillus prodigiosus last January. He is still in good health without any trace of a recurrence.

Anent the same question Mr. Edred M. Corner of London (*The British Journ. of Surgery*, April, 1914) states: "For a long time some clinicians have recognized the doubtful value of the microscopist's diagnosis of sarcoma, particularly in children. Dr. Nabarro and Mr. Higgins have now reported most fully an indubitable case in which a similar doubtfulness was shown to exist in the diagnosis of carcinoma by 'most high' morbid anatomists. Such a record tells us that cases of the cure of malignant disease cannot be accepted when based upon mere miscroscopical evidence. The final court of appeal is the clinical court. And if the opinions of that court differ from those of the pathologists, the 'casting' vote is with the clinicians. All these considerations thrust increased responsibility on the clinician, who must not rest content with the mere practice of his art, but must keep abreast with and advance the science of surgery."

If we go outside of the strict limits of the long bone tumors, we find even more striking proof, that we should not attach too great weight to a negative pathological report of a specimen removed by exploratory operation.

Elmsley, in referring to two cases, the specimens of which he found at St. Bartholomew's Museum (femurs), states his belief that the majority of mistakes and failures after exploratory incisions are due to the fact that not enough tissue is removed to show the characteristic structure of the growth. I agree with him that this is probably true in the majority of cases in which the pathological reports are in error.

I recall one case that has impressed itself very strongly upon my mind, namely, that of a rapidly growing tumor of the testicle, immediately following an injury, and which had attained the size of a closed fist in

[3] The early report of the pathologist (Dr. Jas. Ewing) in this case read: "Seven different portions of the material received are under examination. *In none of them is there the slightest trace of any form of sarcoma.* The tissue shows chronic osteitis and myositis, such as commonly arises after traumatism to the bone or periosteum. The changes in the muscle are not those typical of myositis ossificans, and yet new bone appears to be forming in close proximity to the atrophying muscle. I should prefer to give the diagnosis of chronic formative osteitis."

four weeks. An aspirating needle drew only blood. Relying upon my clinical diagnosis of a very highly malignant tumor, I immediately operated, removing the entire testicle through a Bassini incision, as for an inguinal hernia; I also removed the cord as high up as possible. The entire tumor was sent to the laboratory and was very carefully examined by two of the most competent pathologists, one a professor of pathology in a leading medical school,—and the report was that no evidence of malignancy existed. Three months later, the patient entered Bellevue Hospital with a very large retroperitoneal tumor. An exploratory operation was done and a portion of the tumor removed by Dr. B. F. Curtis; microscopical examination at this time proved it to be sarcoma. The man died a few weeks later, the entire course of the disease covering a period of only five months.

Another very striking case in my own experience is that of a boy of twelve, with a very rapidly growing tumor of the scapula. A portion was removed by another surgeon and pronounced by a competent pathologist, hyperplasia, with no evidence of malignancy. The large tumor diminished to nearly half its original size under the mixed toxin treatment. The patient was then sent to my service at the General Memorial Hospital. The clinical as well as X-ray diagnosis of sarcoma being absolutely certain, I was desirous to have it confirmed by the microscope and therefore removed another good-sized portion of the tumor and had it examined by another pathologist who made the same diagnosis as the former. Shortly afterward the tumor began to increase in size in spite of further treatment, glands developed above the clavicle; one of these, the size of a hickory nut, was removed for miscroscopical examination and again a negative report was received: "No evidence of malignancy found." The disease progressed very rapidly and killed the boy within a few months, and, finally, microscopical examination confirmed the original clinical diagnosis of sarcoma.

In the discussion of sarcoma (*Royal Soc. of Med.*, November, 1912) it was stated, that there was at present little evidence upon which to base the prognosis in cases of chondrosarcoma. The following cases may be of interest in this connection:

Case I.—*Subperiosteal sarcoma of the tibia.* E. McG., male, sixteen years. Family history negative. Personal history: Was struck over the upper portion of the right tibia by a hockey stick. One month later he noticed a swelling at the site of the injury and some tenderness but little pain. In March, 1911, the swelling, which was regarded as an abscess, was opened by a physician. Nothing but blood was found. The enlargement slowly increased in size. On April 20, a second operation was performed, and a tumor, apparently of periosteal origin, was found, fusiform in shape, beginning three inches below the joint and extending downward 5 inches. Some grayish-white, non-vascular material was removed. The substance of the tumor was found smooth and hard, without erosion; the growth evidently originated in the shaft of the tibia. A microscopical examination was made by Dr. Collison, pathologist of the Post-Graduate

Hospital, who pronounced it simple chondroma, non-malignant. Primary union occurred. A local recurrence was noticed six weeks later. An X-ray taken before the operation showed nothing characteristic. A third operation was performed on June 25, 1911. The tissue at this time was examined by Dr. Jeffries, pathologist of the Polyclinic Hospital, and pronounced mixed-celled sarcoma, of mild malignancy. A small swollen gland beneath the sartorius muscle, the size of an English walnut, was removed. The tumor recurred almost at once and grew very rapidly.

Physical examination by myself, September 6, 1911, showed a very large tumor at the junction of the middle and lower third and extending to the upper end of the tibia which was three times the size of the other side; there was a fungating mass in the centre, bleeding easily. The disease ran a rapid course.

This case again proves that we cannot place too implicit reliance upon a negative pathological report, or a report of a benign lesion in tumors of the long bones. The first report of the pathologist read: Chondroma, non-malignant; in spite of an almost immediate recurrence, with rapid growth, the report of the second pathologist stated: Mixed-celled sarcoma of mild malignancy. Recurrence again quickly followed with metastases in the glands.

My experience in sarcoma of the long bones and, in fact, bones in general, has been that in certain cases, a tumor, pronounced pure chondroma by the pathologist, promptly recurs, and may exhibit a high degree of malignancy.

That chondrosarcoma may be of extreme malignancy, is shown by the case reported by Henry J. Clark, of the Doncaster Royal Infirmary, London (*Practitioner*, 1912, vol. 46, p. 869). The history in brief is as follows:

Youth, aged fifteen years, injured while playing foot-ball on October 3, 1911. He first consulted a physician on October 11, who took the trouble for a sprain. Seen by Mr. Clark, November 1. Physical examination at this time showed a tender spot over the external semilunar cartilage; no swelling; joint freely movable. November 8, confined to bed; pains in all joints. Temperature 102°; thought to be acute rheumatic fever; there was no swelling. November 11, the pains had left the other joints but a stabbing pain remained in the right knee, which grew worse at night; temperature still higher in the evening. Bone abscess suspected. November 18, an X-ray was taken which showed a lesion in the upper end of the tibia.

Operation November 27, 1911, disclosed a cartilaginous tumor eroding its way into the head of the tibia, and apparently attached to the outer end of the epiphyseal cartilage. The tumor was excised and a small cavity, about 1½ inches in size, was left in the head of the tibia.

The specimen was sent to the Clinical Research Association, London, for examination, and the following report was received:

"The bulk of the specimen is composed of cartilage, but it contains an

unusual amount of cellular elements, and on one surface these are proliferating freely and producing a mass of tissue having the characteristics of a spindle-celled sarcoma. There is no normal tissue included with the growth, so that we are unable to say to what extent it infiltrates. We must, however, regard it as a chondrosarcoma, probably not highly malignant."

In view of the pathological report, it was decided to wait. The wound healed by first intention. The progress was favorable until December 24, one month later, when hemorrhage commenced and continued from the sinus left by the drainage tube. The patient became rapidly worse; the pain was very intense, requiring morphine. An unusual feature of the case was the temperature which remained high, reaching 104° some evenings. Curettings removed through the sinus were sent to the Clinical Research Laboratory, which made the following report:

"These fragments are composed of a chondrosarcomatous growth, which consists of small spindle-shaped cells and a few myeloid elements. The cartilaginous tissue is small in amount and is infiltrated with calcareous material. There can be no doubt of the malignancy of the formation."

Amputation of the thigh was done on January 5, 1912. The patient made a satisfactory recovery, the wound healed by primary intention; his general health rapidly improved and he was discharged from the Hospital on February 7. All went well until March 10, when he began to have violent headaches, vertigo and vomiting. The tumor rapidly grew worse and he died shortly afterward from secondary deposits in the brain. There was no local recurrence. The earlier duration of the disease was less than 5 months.

A brief report of the following personal cases, bearing upon the malignancy of the disease, may be of interest:

Chondrosarcoma. M., male, tumor of ilium. Patient was referred to me in 1894 by Dr. Geo. Shrady, with a very large tumor of the ilium. Microscopical examination showed it to be a chondrosarcoma. The tumor entirely disappeared under the mixed toxin treatment. Seven months later the disease recurred, grew very rapidly and killed the patient within a year.

Inoperable osteochondroma of infraclavicular region. R. B., male, referred to me by Dr. J. F. Erdmann of this city in August, 1911. Patient had injured a rib eight years ago; 4 years later began to notice that his left shoulder was raised. Two years after that he noticed a hard, painless swelling in the left pectoral region just below the clavicle. This gradually increased in size and in 1910 began to interfere with the movements of the arm. The X-ray diagnosis was, "in all probability osteochondroma." I first saw the patient in August, 1911, at which time physical examination showed a markedly protuberant tumor occupying the whole left pectoral and axillary region, extending up to the clavicle. The skin was normal in appearance, although the veins were slightly enlarged. The tumor itself had a very hard, cartilaginous "feel." It was irregular, nodular, though somewhat variable in consistence. The left clavicle seemed to have been disarticulated from the

sternum and raised 1½ inches above its normal position. Just above the clavicle, apparently springing from it; there was a firmly fixed growth, not quite the size of a hen's egg. The axillary glands were not involved. The toxin treatment was begun with the result that under the treatment the tumor was reduced to four-fifths of its former size. At the end of two weeks an incision was made and broken-down tissue removed; free drainage was continued for two months. The patient's general health became greatly improved, so much so that he discontinued taking the toxins. Soon after the disease began to grow again and gradually attained to more than its original size. He was later treated by another surgeon with extremely large doses of radium. However, he died in the latter part of 1913. Dr. Ewing's report in this case read: Pure chondroma.

Tumor of the femur; chondroma. Amputation below the trochanter (1909). Patient remained well for nearly five years, when she had a local recurrence in the gluteal region about the size of a child's head. This was removed by me in January, 1914. Microscopical examination, by Dr. Jas. Ewing, showed it to be a pure chondroma. Three X-ray treatments were given after operation and prophylactic treatments with the mixed toxins were given for two months. She is in good health at present.

Another interesting case associated with chondrosarcoma, I recently observed at St. Vincent's Hospital on the service of Dr. F. S. Dennis. The history is briefly as follows:

Male, thirty-seven years of age; tumor developed in the ilium shortly after a severe bruise from falling into a coal hole. In the course of a year it grew to a very large size, measuring 31 cm. in both directions, and was entirely inoperable. A portion removed for microscopical examination was pronounced chondrosarcoma of spindle-celled type by the pathologist of the Bellevue Hospital. The mixed toxins were begun January 5, 1914, under my direction, chiefly local injections being made. Under less than a month's treatment the tumor became largely necrotic and fluctuating; I advised free incision and drainage under ether, which was done; the sloughing continued with very profuse discharge. One month later four applications of radium were given by Dr. J. B. Bissell. The patient continued to improve, and was discharged from the hospital in April, in good condition, with only a small superficial sinus, an inch deep, remaining.

Subsequent Note.—On June 5th, I made a physical examination of the patient and found no trace of the tumor; his health and weight had been restored to normal, and he had returned to work.

In many of the cases of periosteal sarcoma of the femur, I have found the presence of cartilage mixed with round- and spindle-cells, rather than pure chondroma. I believe, however, that the prognosis in such cases is not materially affected by the cartilage. They are all highly malignant.

Space will not permit a detailed report of these cases here. My paper on "Sarcoma of the Long Bones," published in 1907, contains a tabulated report of some of the cases, the subsequent histories of

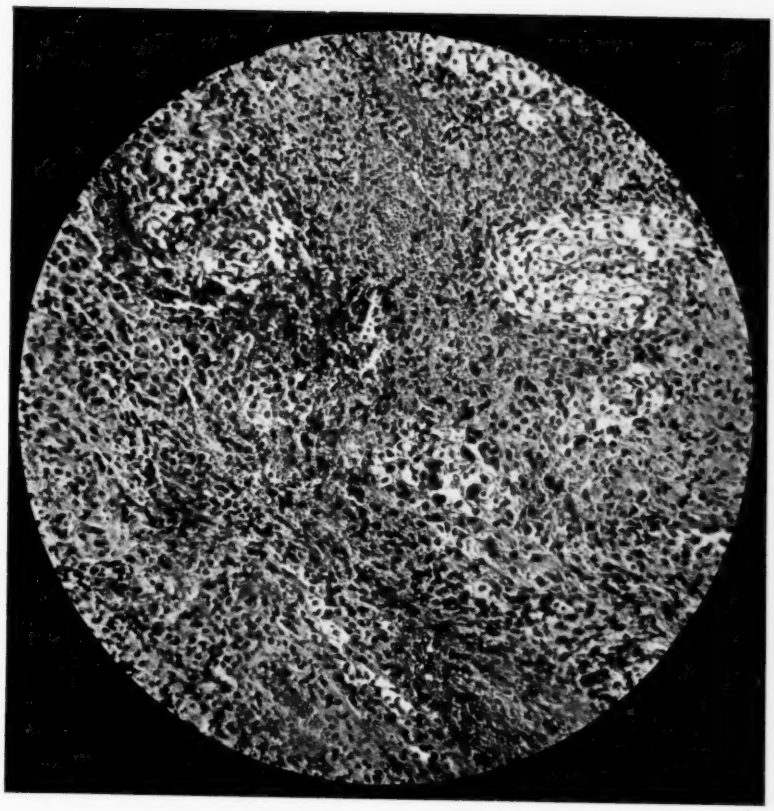

FIG. 7.—F. L. Periosteal sarcoma of humerus; round- and spindle-celled. Patient well over four years.

FIG. 8.—G. M. October, 1912. Periosteal sarcoma of femur. Clinical and X-ray diagnosis. Negative Wassermann.

FIG. 9.—G. M. January, 1914.

FIG. 10.—G. M. January, 1914.

which have been published in later papers. I merely refer in detail to a few of the more important cases:

Sarcoma of the humerus. F. L., thirty-five years of age. No history of cancer in the family; a man of splendid physique, six feet tall, weighing 180 pounds. Early in January, 1910, he fell and received a spiral fracture of the left humerus at about the junction of the middle and upper thirds. He was treated at the Hudson Street Hospital, and then returned to Baltimore, where he was treated by Dr. W. A. Fisher. An X-ray taken at this time showed a spiral fracture without any trace whatever of a new growth. Two to three weeks later he began to have severe pain at the site of the fracture. Another X-ray photograph was taken, showing that in the meantime there had developed a well-marked tumor, apparently a sarcoma, involving both the central portion and the periosteum. The growth increased rapidly in size, and was accompanied by very severe and constant pain.

In June, 1910, an exploratory operation was performed by Dr. J. M. T. Finney, who found a large sarcomatous growth, involving both the central and periosteal portion of the humerus and extending from about the junction of the middle and upper thirds nearly to the head of the bone. The bone was completely destroyed; a pathological fracture had occurred and there was a flail-joint. The central portion of the tumor was curetted; in Dr. Finney's opinion amputation offered no hope of a cure.

The patient was referred to me by Dr. Finney for the toxin treatment, which was begun June 16, 1910, and continued in small doses, most of them being given systemically in the pectoral region and a few in the arm. There was slow but steady decrease in the size of the tumor, and immediate cessation of the pain, which had been constant from the first appearance of the tumor. The shell of bone about the tumor, which, as stated, had undergone spontaneous fracture, gradually became harder with the formation of new bone, and within a few weeks complete union had occurred. The large cavity gradually filled up with granulation. Several curettements showed the material to be sarcoma of the same type as the original tumor, namely, spindle-celled. The pathological examinations were made by Dr. J. C. Bloodgood of Johns Hopkins and also by Dr. James Ewing, Professor of Pathology at Cornell University Medical School. Dr. Bloodgood regarded it as of the very malignant type of sarcoma which he characterized as "bone aneurism."

Another X-ray examination in the latter part of 1910 showed that the new growth had apparently entirely disappeared and there was firm union of the arm. The patient's general condition was excellent. In November, the granulations began to increase in size, and in spite of curetting, quickly recurred. An X-ray taken in December showed a small shadow starting in the periosteum, in the axillary region, and I finally decided, early in January, to do a shoulder-joint amputation.

Six months later there was a very extensive recurrence in the pectoral muscle, the size of a closed fist. The tumor was removed, but the operation was necessarily incomplete, and I had little hope of controlling the disease. The toxins, however, were immediately resumed and the treatment persisted in for nearly six months longer. Since that time he has had no recurrence, and

has remained in good health, working as a mechanical engineer ever since. A telegram received from him on April 8, 1914 (nearly four years later) stated that he was never in better health.

Another case of sarcoma of the humerus, successfully treated with the mixed toxins, with preservation of the limb as well as the life, is worthy of brief note:

A. C., female, thirty-one years old, was operated upon by Dr. J. B. Blake, of Boston, in 1899, for sarcoma of the upper end of the humerus involving the tip of the coracoid and part of the glenoid cavity of the scapula. It was impossible to make a thorough removal of the disease without a complete interscapulothoracic amputation. A very incomplete operation, consisting in practically nothing more than curetting, was performed, and the patient treated as an inoperable case and put upon the mixed toxins of erysipelas and bacillus prodigiosus which were administered under my direction. The toxins were given for 3–4 months immediately after the wound healed. The tumor entirely disappeared. Examination made by Dr. Blake on December 11, 1903, four years later, showed the patient to have gained 10 pounds in weight; she was performing her regular work as housemaid. The motions of the shoulder (left) are anteroposterior, two-thirds normal; rotation, half normal; abduction to nearly 90°, beyond which point the elbow could not be raised.

Seven years later, in 1906, I personally showed the patient before the Surgical Section of the American Medical Association in Boston, and learned that she was in good health in 1913, 14 years after treatment.

June 12, 1914: In accordance with a letter just received from Dr. Blake, the patient had a right cerebral hemorrhage about a year ago, which left her with an almost complete unilateral paralysis. He states that he saw her at the time, but could find no trace of sarcoma anywhere.

The microscopical examination in this case was round-celled osteosarcoma of the humerus. Inasmuch as there are practically no cases on record of sarcoma of the humerus cured by operation, even after as extensive a procedure as interscapulothoracic amputation,[4] these two cases speak strongly in favor of the value of the toxins even in the most malignant types of sarcoma of the long bones.

Periosteal sarcoma of right femur. G. M., female, twenty-seven years of age. In May, 1912, first noticed pain in leg; began to lose weight. A diagnosis of periosteal sarcoma was made on basis of clinical history and physical and X-ray examinations, and immediate amputation was advised, but refused. Patient was referred to me in September, 1912, and entered the General Memorial Hospital for the toxin treatment. Measurements over upper, middle and lower parts of tumor were as follows: Right, 16 inches; 18½ inches; 19½ inches; left, 15½ inches; 17½ inches; 18¼ inches. Wassermann reaction negative. I concurred in the diagnosis of periosteal sarcoma. At the end of a week, I made an exploratory incision removing a wedge-shaped portion of the tumor, which latter clinically had every appearance of a periosteal sarcoma originating in the shaft of the bone. The specimen was sent to Dr. Ewing, who reported as follows:

[4] Mr. Gask's statistical report of the results of operation in cases of sarcoma of the long bones observed at St. Bartholomew's Hospital, London, from 1902–1911, shows not a single cure of sarcoma of the humerus.

(September 28, 1912): "The tissue shows very little if any specific process and does not permit of a diagnosis. There is infiltration of the vessels with large round-cells, suggesting sarcoma, but which might very well be tuberculous. I ought not to express any opinion on the data received and I would not amputate without further information."

The toxins were begun, the initial dose being ½ minim, which was carried up to 6 minims, injections being given 4–5 times a week. At the end of two weeks there was marked diminution in the circumference of the thigh. In view of the lack of certainty in Dr. Ewing's diagnosis, and the rapid improvement under the toxin treatment, I decided on November 1 to make another exploratory incision. Clinically the tumor had the appearance of a partially necrotic sarcoma. Dr. Ewing's report of this specimen reads:

"Five sections from five different parts of the tissue received fail to show any signs of sarcoma. There is suppurative inflammation in an area lined with granulation tissue. I find no signs of syphilis or tubercle. The condition suggests to me a pyogenic infection of the periosteum or osteomyelitis."

A number of X-ray photographs was taken by Drs. Cole and Holding, who believed the condition to be periosteal sarcoma. The tumor continued to decrease in size and at the end of six weeks the circumference of the thigh was nearly normal. The patient had gained ten pounds in weight. She returned home to have the toxins continued by her family physician. When I saw her again in January, 1913, the tumor had increased in size although her general health had remained good. Under larger and more frequent doses of the toxins, the tumor again began to decrease in size. The toxins were kept up until the latter part of 1913, 2–3 times a week in doses up to 12 minims, which were followed by moderate reactions. All injections were given systemically. X-ray photograph taken January 5, 1914, showed the density of the bone to have increased without any evidence of increase in size. As a sinus had persisted, I determined to enlarge it to see if a piece of bone had not been the cause of its failure to heal. Microscopical examination by Dr. James Ewing (of the tissue removed) reads:

(January 6, 1914): "The tissues in the case of Mrs. M. fail to show any definite evidence of a tumor. They represent dense fibrous tissue, the vessels of which are sheathed by numerous plasma cells. It is possible that these cells are a derivative of a perforating marrow tumor of the type of multiple myeloma, but the appearance is more suggestive of chronic inflammation. The wall of the sinus is lined by cellular and œdematous granulation tissue."

After this the sinus closed. The patient continued to gain in weight, and was shown by me before the International Surgical Congress in April, 1914, in perfect health, measurements of both thighs being the same.

The typical clinical picture at the beginning, the marked improvement under the toxins, followed by increased growth after the treatment was stopped, again followed by improvement on resumption of treatment, and final recovery of normal health, leave little ground for doubting the correctness of the clinical diagnosis of periosteal sarcoma, and the X-ray picture furnishes strong confirmatory evidence.

Were there no other cases of periosteal sarcoma on record in which a similar result had occurred, the diagnosis could not be accepted too implicitly

without confirmation by microscopical examination. However, in case No. 5 a much larger periosteal tumor of the femur with extensive metastases did completely disappear under the toxins, and the patient remained well for ten years. In this case the diagnosis was confirmed by microscopical examination made by Dr. E. K. Dunham, Professor of Pathology at Bellevue University Medical School, and Dr. B. H. Buxton.

At the discussion at the Royal Society in 1913, Sir Frederick Eve touched briefly upon the question of the use of the toxins in sarcoma of the long bones. He stated that he had not been convinced of their value as a prophylactic after amputation. His opinion was based upon a comparatively limited experience at the London Hospital at which institution the toxins had been tried in ten cases. Five of these were periosteal sarcoma, and it is worthy of note that the only case of the latter in which the patient survived the operation over two years was one in which the toxins had been thoroughly tried before amputation. At the time of the report, that patient was in good health and free from recurrence, 2 years and 7 months later.

That the toxins may materially alter the malignancy of the tumor, without destroying it altogether, is illustrated by one of my own cases, a very rapidly growing and extensive periosteal sarcoma involving the upper two-thirds of the femur, which I regarded entirely beyond hip-joint amputation. The toxins were given for a period of four months. At first there was some diminution in size, but later no further beneficial effect was noticeable. The patient returned home and later a hip-joint amputation was done at another hospital. This patient was alive and in good health when I last heard from him, 1½ years thereafter.

The most conclusive evidence of the value of the mixed toxins in periosteal sarcoma of the long bones, is furnished, I believe, by the case reported in full detail before the American Surgical Association a year ago (*Transactions of the American Surgical Association*, 1913, and ANNALS OF SURGERY, July, 1913). It is sufficient here to state that the patient, A. G., male, nineteen years of age, had a very large periosteal round-celled sarcoma involving two-thirds of the shaft of the femur, with very extensive metastases in the pectoral and iliolumbar regions. The case was regarded as hopeless. Prolonged X-ray treatment had been used upon the tumor in the femur (February, 1902). Also some X-rays were used in the pectoral region after the tumor had been partially excised, but no X-rays were used on the very large iliolumbar tumor involving the ilium. This disappeared under the toxin treatment alone and the boy remained perfectly well for ten years, when he developed a rapidly growing tumor at the site of the old X-ray dermatitis

of the thigh, which tumor proved to be partly round-celled sarcoma and partly epithelioma originating in the soft parts, but not the bone; it proved highly malignant, causing death from metastasis shortly after the operation. In conclusion I may repeat what I have said in a previous paper.

"In view of these results I think we are justified in giving-up of the traditional method of treating all cases of sarcoma of the long bones by immediate amputation. In most cases I believe it safe to wait for two or three weeks, the time required for a trial with the toxins, before sacrificing the limb. Sarcoma cases of extremely rapid growth will probably show little or no effect from the toxins, and one might naturally say valuable time had been lost by the preliminary use of the toxins. It is my opinion, however, that early operation in these cases would not have been of the slightest avail, as shown by the long, almost unbroken list of recurrences and deaths in cases treated by operation alone. On the other hand, in certain cases—probably a small number—the limb will be saved by the preliminary use of the toxins. In those in which early improvement is not marked, operation can then be performed with even greater chances of ultimate success than if the toxins had not been first used.

"The greatest value of the toxins in sarcoma of the long bones will, I believe, be shown to lie in a judicious combination with conservative operative treatment. By such procedure a hip-joint amputation, which has been the almost uniform rule for sarcoma of the femur, will give place to an amputation below the trochanter, which will leave a stump of sufficient length to permit the wearing of an artificial limb, and this is no small gain. The toxins will be administered for a considerable period of time after amputation with the hope of destroying the cells which are left behind and which, with operative treatment alone, cause the local and metastatic recurrences. The same rules will apply to sarcoma of the humerus.

"Coming to sarcoma of the tibia, fibula and radius and ulna, particularly of the myeloid type, in place of amputation as formerly advised and still advocated by the great majority of surgeons, we can safely substitute either curetting or partial resection, followed by a thorough course of the mixed toxins. While good results have been obtained from operation alone in a very limited number of cases in this group, I am convinced that the number of successes will be greatly increased by combining the toxin treatment with conservative operation, as I have suggested, and my series of cases strongly supports this opinion."

SUMMARY

The chief requirements for the early diagnosis of sarcoma of the long bones may be summarized as follows:

1. A more careful study of all known clinical data.

2. A larger clinical experience in the diagnosis of sarcoma of the long bones.

3. Early and repeated X-ray examinations in all cases of suspected swellings of the long bones, especially those following trauma.

4. Exploratory operation and microscopic examination of the tissue removed in selected cases, but *not* as a routine measure.

5. Realization of the importance of not placing implicit reliance upon the negative report of the pathologist, especially when in conflict with clinical and X-ray evidence that is strongly positive.

EXPERIENCES IN THE TREATMENT OF MALIGNANT TUMORS BY RADIUM*

By Richard Sparmann, M.D.
of Vienna

My chief, Professor Freiherr von Eiselsberg, of Vienna, asked me to report his experience to date in the treatment of malignant tumors by radium in his service in the General Hospital of Vienna.

Since July, 1913, we have handled 52 cases of inoperable malignant growths (carcinomas and sarcomas). I emphasize particularly the fact that all our cases were inoperable because from the very beginning we were convinced that we should not treat with radium any operable tumors. Moreover, we have used radiation following an operation on tumors which were not radically removed. In every case the clinical diagnosis of malignant tumor was confirmed by a histological examination.

Before I go into any detail about these cases and the conclusions we came to, I would like to say a few words about our method of the application of radium. We had 225 mg. radium and 150 mg. mesothorium at our disposal. This quantity was divided into fifteen applicators. These were applied partially externally and partially internally; in the latter case in the periphery of the tumor. We often reduced the tumor as much as possible before the irradiation. We also made use of cross fire. The filters were made of silver, gold, platinum, magnalium, and brass, or of rubber in various thicknesses from ½ to 2 mg.

At first we gave big doses up to 11,000 mg. hours at a time. In the last five months, however, we used at the most 1200 to 2000 mg. hours for one dose. We made this change because we found that it had often such a great influence on the general condition of the patient, or that the radium destroyed the healthy tissues far beyond the limits of the tumor in too short a time. In every case the patients were given arsenic in the form of Fowler's arsenic solution to improve their general condition.

We divided our cases into two series, the first of which received preventive and the second curative treatment. Of 6 treated in the first way, only 1 has remained free from recurrence. Among all the cases treated

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* Read before the American Surgical Society, April, 1914.

curatively as well as preventively, only 11 have remained free from tumors up to this time. Of these 7 treated curatively were 5 cases of epithelioma cutis (basal zellencarc). One was a case of carcinoma linguæ, 1 a case of metastasis in the lymph-glands after sarcoma axillæ. Of the 4 treated preventively, 3 cases were carcinoma of the mucous membrane of the mouth, 1 sarcoma orbitæ. In 6 cases we noted improvement, 14 were aggravated and in 5 no effect could be seen during the period of treatment. Seventeen died. Of these 17 cases 11 died of tumor, mostly of cachexia, 1 from hemorrhage, 2 of meningitis, 1 of old age, 1 of diabetes, and 1 of mediastinitis.

Formerly, we had the hope that it might be possible to prevent, or at least retard, recurrence by preventive irradiation. Now, however, we have come to the conclusion that on the contrary the recurrence was sometimes hastened by post-operative irradiation, possibly due to a local hyperæmia caused by the radium.

From the above-mentioned results it is seen that radium is not a panacea for malignant tumors. Not only does it not always help, but it often even injures patients as well in regard to the local lesions as by its harmful effect upon the general condition, manifested by tachycardia with a pulse rate up to 120 and 140, dizziness, weakness, and vomiting. The latter has been observed especially after irradiation of the neck, probably due to irritation of the vagus. The local ill-effect is especially marked in that the healthy tissues are badly injured so that we cannot prevent their further destruction. There is furthermore a great danger of causing a hemorrhage or perforating a hollow organ, such as the intestines. We had 11 hemorrhages among our cases, 1 of them lethal. Another case died of mediastinitis.

There is no such thing as elective effect. The tumor cell is not more easily destroyed because of the specific action of the radium itself, but being a degenerated cell, it is more susceptible to the effect of any trauma. We have seen only a greater susceptibility of the epithelium in contrast to the fibrous tissue.

As far as histological changes are concerned, I can only make the statement that there is no specific change in the tissues to be seen by radium irradiation. All we see is only necrosis and subsequent scar-formation, such as could be formed spontaneously in any tumor tissue.

Radium has only a local effect, therefore it can never take the place of an operation by which we can reach as far as possible all parts of tumor dissemination as by the Wertheim operation of cancer of the uterus, or by the operation of cancer of the breast with removal of the

lymphatic glands. We have noticed in certain cases that during the treatment metastatic foci have been formed in lymphatic glands.

The indication for treatment by radium in the case of a growth which has attacked a vital organ must be the same as for an operation.

The hopes, therefore, we placed in radium as a new and successful means in the treatment of malignant tumors have not been realized. Moreover, the number of cases in which one might have recourse to radium therapeutics shrinks constantly as our experience progresses.

OSTITIS FIBROSA CYSTICA*

By Lyndon Holt Landon, M.D.
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Acute intraosseous diseases of the long bones possessing a more or less clear etiology and definite clinical characteristics, present little or no difficulty in diagnosis, prognosis or treatment. With the quite multitudinous variety of affections of a chronic nature that may involve the same structures, the conditions and problems with which the surgeon has to deal are wholly changed. That quite different and definite pathological entities, some requiring little or none and others very extensive operative procedures, may be represented by essentially like clinical phenomena, is well known. This necessitates the most searching and scientific analysis of this group of cases, not simply from the academic standpoint but as an insurance of the ultimate welfare of the patient, for we must rely entirely upon exactness of diagnosis for a guide to the proper prognosis and treatment.

Upon a broad morphological basis we may subdivide the chronic intraosseous affections into:

1. Those dependent upon infection.
2. The purely metaplastic processes.
3. The neoplastic, which are either benign or malignant.

In the first group we encounter tuberculosis, lues and chronic osteomyelitis, primary or secondary, either diffuse involving large areas or circumscribed in the form of an abscess, the so-called ostitis albuminosa. The last group is represented chiefly by the sarcomata which vary greatly in their malignancy, and by the more rare and benign growths, enchondromata, myxomata and fibromata. In the second group or metaplastic type the one of chief importance is dependent upon that peculiar metamorphosis of a part or a whole of a single or many bones of the skeleton into fibrous tissue with a decided tendency to the formation of cysts.

Although previous to 1876 sporadic cases of bone cysts had been reported from autopsy findings, it was not until this date that Virchow definitely drew attention to their occurrence. Thirteen years later Hirschberg first observed and described ostitis fibrosa, but looked upon

* Read before the Philadelphia Academy of Surgery, April 6, 1914.

it as a late stage of osteomalacia with the formation of cysts. Its identity as a separate disease was not established until 1891, when von Recklinghausen published his monograph. From this time until within the last few years little but academic interest was shown. In 1902 Koch collected 23 cases, while Heineche, in 1903, published the report of the first case of bone cysts in which radiographic pictures were made. This was followed by the collection and study of 43 cases by Muller in 1906. Pfeiffer's paper appeared one year later and Bloodgood's in 1910 with analysis of 69 cases reported up to that date. Now that the radiograph has enabled the discovery of its rather frequent occurrence, we can no longer neglect its consideration in the study of many cases of obscure intraosseous lesions. It is with the hope of adding slightly to the slowly accumulating knowledge in regard to bone cysts that the report of our cases is made.

That a cyst of bone may result secondarily from any of a number of primary pathological changes is of course patent and is recognized by all writers on this subject. In reviewing the cases of bone cysts found in the literature, one sees that much confusion has arisen from this intermingling of secondary cystic changes or degeneration in other processes with those cases of true simple cysts. According to Silver, "the term 'bone cyst' should be used in a more specific sense to include those cases within the bone of a cavity filled with fluid as the most prominent symptom and in which no other definite disease can be discovered either from examination of the cystic contents or of the surrounding bone." Assuming that this restriction is reasonable and correct, we must exclude from the true bone cysts those dependent upon or secondary to:

1. The liquefaction of subperiosteal hæmatomata which have become included by a surrounding shell of reactionary ostitis.
2. Cysts occurring occasionally in callus.
3. Those resulting from the breaking down of neoplastic growths, sarcoma, myeloma, fibroma, myxoma and enchondroma.
4. Those appearing at times in Paget's disease and arthritis deformans.
5. Cystic changes in osteomalacia.
6. Echinococcus cysts.
7. Dentigerous cysts.
8. Cysts accompanying von Recklinghausen's disease or general ostitis fibrosa.

No sharp distinction can of course be made between the latter and the cysts under discussion, except that of its limitation to one bone in

which the cyst formation is the prominent change while in general ostitis fibrosa they are of minor importance.

The essential underlying process leading to the production of cysts is ostitis fibrosa of the type limited to a part or whole of a single bone. Although the nomenclature would place it among the inflammatory types of intraosseous affections, it cannot essentially be regarded as such, various opinions to the contrary, notably Bloodgood, who states, " I agree with all the more recent writers that the disease is an inflammatory one, in which the medullary tissue is replaced by a new formation of connective tissue with or without cyst formation and that the term ostitis fibrosa is not an inappropriate one, although it would appear that the term chronic osteomyelitis fibrosa cystica or solida would describe the condition more fully." Murphy is also of the opinion that it is an inflammatory process. While it may be a metaplastic process dependent upon a foregoing inflammation of a chronic attenuated character, in itself it has none of the ear marks which we associate with inflammatory changes. Its almost invariable situation at first in the centre of the bone, always at first a medullary occupant, its equal expansion in all directions with no sign of surrounding regeneration or thickening or active periosteal overgrowth, and the preservation of the latter in unbroken outline even when the periosteum is in direct contact with the cyst wall, all argue against our concept of osseous inflammation. On the other hand, the pathological picture of ostitis fibrosa is a strong witness for its metaplastic nature. The metamorphosis of the marrow into masses of fibrous tissue with subsequent degeneration of these fibrous masses into serous, mucoid or fatty material, portions showing cartilage or bony formation, all you will note of the same embryological type, corresponds perfectly with the changes in true metaplasia. This similarity has been well brought out by Freiberg.

The process usually shows a single cyst, of varying sizes, often egg shaped, with or without a lining membrane, the surrounding bone the seat of ostitis fibrosa. Cysts may, however, be multiple, unilocular or multilocular, the walls smooth or deeply ridged. Their contents have almost invariably been serous or blood-stained serous fluid. The cyst of the fifth metacarpal bone reported by McDill last October, when opened, discharged stringy mucopus. This cyst was not obviously one of those under discussion, occurring in a woman of sixty-five and apparently secondary to chronic osteo-arthritic disease. It should not be placed among the primary bone cysts.

The presence or absence of a lining membrane, except the greater

possibility of secondary neoplastic change, is apparently of little practical importance while it is possible that the lining is an asset acquired during the later life of the cyst. Engel's case of multiple cysts in which the smaller and presumably the younger cysts did not possess a lining while the larger ones were lined by a membrane of some thickness is suggestive, while even more convincing is the case reported by Silver where at a second operation for recurrence of a cyst of the upper end of the femur, in a boy of four years, a distinct lining membrane was found where at the previous operation twenty months before, the most careful examination failed to reveal any but a smooth, bony wall.

My first case which I am enabled to report through the kindness of Dr. Frazier, is also illustrative of the lining membrane being an acquisition of the more mature cysts.

M. T., male, aged twenty, Polish, was admitted to Dr. Frazier's service at the University Hospital, October 1, 1913. A miner by occupation, two weeks previously he had been struck on the dorsum of the first metacarpal of the left hand by a piece of falling rock. This caused a slight wound ½ cm. in length which bled profusely and had continued to bleed at each dressing, being controlled with difficulty up to the time of admission. Fifteen years previously, or at the age of five, there had been noticed a swelling at this spot which increased gradually but without pain or interference of function. Between that time and the date of migration to this country, three years ago, two operations had been performed for this swelling. What was done or the nature of the process was unknown to the patient, who was very illiterate and from whom a detailed history could not be obtained. The wounds, however, always healed quickly and there was little or no change in the progress of the enlargement following these procedures. There had never been any pain and up to the last two weeks no tenderness or lameness. The patient had never been ill and absolutely denied venereal infection. Nothing was discoverable upon a general physical examination. There was no increase in leucocytes and the blood Wassermann was negative. Upon local examination, there was considerable swelling over the whole region of the metacarpal, which was enlarged, irregular in outline but smooth, except at the point of injury, where it was thought sharp edges of bone could be felt at the junction of the distal and middle thirds of the bone. The wound was slight, surrounded by quite an area of pigmentation and several enlarged veins. Only one scar was discoverable which was parallel with the long axis of the bone and 2½ cm. in length. The wound bled extremely freely and upon probing, bone was easily felt at the bottom. Temperature was 98.6°; pulse 72, respirations 20.

The clinical diagnosis was chronic osteomyelitis with possible incomplete fracture at the site of the injury. The radiograph, however, was somewhat disconcerting (Fig. 1). It shows the whole bone tremendously enlarged, affecting all but the epiphysis. There is apparently no thickening of the periosteum which appears intact. The rarefaction or honeycombed appearance of the entire diseased area was remarkable, while no distinction between medulla and cortex

remained. This picture is more suggestive of a specific origin of the condition. Through the kindness of Dr. Frazier, on October 15, under gas-ether anæsthesia, I exposed the bone by a longitudinal incision 2½ cm. in length with the wound at its centre and excising the old scar. Upon exposure, the periosteum was intact, but as soon as this was incised, the hemorrhage was profuse and continued to ooze from the bone. The exposed bone was extremely rarefied, fragile and consisted of many small liquified areas surrounded by the thin fragile shells. The contents of the cells was for the most part a thin gelatinous substance, but at places free blood and active bleeding was encountered. Bearing in mind the presence of enlarged veins over the site of the tumor, the radiographic picture and the gross appearance of the bone, I was inclined to think that the process was neoplastic rather than inflammatory. I therefore enlarged the incision and excised the bone *in toto* with its periosteum. The joint surfaces were uninvolved, but the surrounding tissues were like the bone the seat of greatly increased vascularity. Hemorrhage was controlled with difficulty and the wound closed without drainage, the hand dressed in extension. With the exception of some slight superficial infection, the wound healed without reaction.

The pathologic histology proved all previous diagnoses erroneous. The excised bone was 8 cm. in length, the external surface rough and irregular, containing in some places normal periosteum, but for the most part this covering was thickened with fibrous tissue and contained many points of calcification. The articulating ends of the bone were normal in appearance, their surface smooth and regular. Section in the longitudinal axis revealed a surface presenting a honeycombed appearance, the structure being made up of a trabecular bone formation containing many minute cavities and a few larger ones about the size of peas. The contents of these cysts was putty colored, soft in consistency, and in some places yellowish in color, evidently containing fat.

Microscopic examination of this putty-like material revealed a few fat droplets and a homogeneous structureless substance. Section of decalcified bone showed a dense fibrous overgrowth associated with many bone trabeculæ. The compact bone itself showed evidences of rarefication and cyst formation, the Haversian canals being dilated beyond their normal calibre and in many free blood was seen. Some of the larger of the cysts are lined with a cellular formation which resembles recently formed granulation tissue, in that it consists of many leucocytes, embryonic connective tissue and new blood-vessels. The ground substance of the decalcified bone consisted in part of cartilage, of true bone and of areas in which the transition between cartilage and bone was apparently taking place. The gross and histological picture corresponds to the disease described as ostitis fibrosa cystica.

On the third day following operation, the temperature was normal and remained so thereafter. On November 5, or twenty-one days later, a section of rib 6 cm. in length was transplanted by Dr. Frazier to take the place of the excised bone. Fig. 2 shows this graft in position one week later. Again the wound healed *per primam*. The patient was discharged from the hospital on December 1. He could move the forefinger at the metacarpophalangeal joint through an arc of 35°. Efforts have been made to get into touch with this patient to learn the later results, but so far I have been unsuccessful.

Reported cases show that simple cysts may be located in nearly every bone of the body, even the skull, although I have not found any mentioned as occurring in the ribs or vertebræ, and but one case has been previously mentioned where the metacarpal bone was affected. Bloodgood, in a review of 65 cases of simple cysts, found none. Muller did not find any of this bone. Pfeiffer records one which is also mentioned in Silver's list. McDill's case, already mentioned, cannot be admitted because, from its contents, it was undoubtedly of infectious origin. In 50 cysts collected by Muller, 38 per cent. were in the femur, 22 per cent. in the tibia and 16 per cent. in the humerus, the three bones most frequently affected. Bloodgood reverses this order and places the humerus first and tibia last. Of Pfeiffer's 49 cases, 19 were in the femur, 14 at the upper end, 12 of the tibia with 9 at the knee, and 10 of the humerus with 8 at the shoulder. Silver in a very thorough review of the literature up to 1911, collected 97 true bone cysts. Of these, 31 were in the femur, 25 in the humerus, and 15 in the tibia.

Since Silver's paper, six cases besides the three to be reported tonight, have been put on record. Canaguier reports one of the upper end of the humerus, Ashhurst one in the same position, Murphy reports two of the humerus, both at the shoulder, one at the upper end of the tibia, and one of the femur at the hip. The case of multiple cysts reported by Percy is not admitted because more than one bone was involved. So, also, McDill's case for the reasons already given. This brings the list of true bone cysts reported up to the present up to 103, of which 32 are of the femur, 29 of the humerus, and 16 of the tibia. To this number I wish to add the following case, which occurred on Dr. Frazier's service at the University Hospital in September, 1911.

C. S. (Univ. of Penn. Hosp., No. 10124), male, aged fourteen, was admitted to the hospital on account of pain and tenderness in the right thigh above the knee. Twenty-one months previously he had fallen while sliding on the ice, hurt his right thigh, and had some pain and limping, lasting but a few days. One month later he fell again, was picked up unable to walk and taken to a hospital, where he was treated for a fracture of the right femur about three inches below the trochanter. He was in the hospital for three weeks and was discharged with the limb in a cast. This was removed at the end of another two weeks. After a period of some disability and limping, he had no further pain or tenderness, although he noticed that the right leg was slightly shorter than the left. On the day of his admission, he was running when without any apparent cause the right leg suddenly gave way and he fell in a heap. He had considerable pain localized to the site of the old fracture which was marked by a lump on the outer side of the thigh. Family and personal history were absolutely good and there was no suspicion of lues. General physical examination showed a normal healthy boy of fourteen.

The right thigh at the juncture of the middle and upper thirds showed a well marked outward angulation with projection of a hard, rounded, irregular bony mass the size of a large orange. On slightest movement he complained of severe pain running through the tumor, but no crepitus or preternatural mobility could be elicited. There was a shortening of one inch between the tip of the great trochanter and the external malleolus on the affected side. There was distinct eversion of the right foot which the patient could not correct. The patient later stated that the tumor on the outside of his thigh had been present with gradually increasing size ever since his first accident.

The radiograph (Fig. 3) shows the large cyst surrounded by normal appearing bone situated at the site of the former fracture and a second incomplete fracture breaking in to the cystic cavity. For seventeen days the limb was kept in extension with side splints which resulted in a reduction of the shortening to one-half inch. In the meantime, however, the radiograph had shown the presence of two other cysts of almost the same size and separated from the first by thin bony partitions. On October 7, under gas-ether anæsthesia, the patient was operated upon by Dr. Muller. Through a longitudinal incision directly over the tumor, the bone and site of fracture were exposed, the cysts opened, curetted and allowed to fill with blood clot. The walls of the cavities were smooth and lined with a thin membrane resembling newly formed granulation tissue in that it was soft and easily bled. The wound was closed without drainage, while the Buck's extension and side splints were reapplied. The wound healed perfectly, convalescence was normal, and on November 18 the patient was discharged with good functional result and legs of equal length. Fig. 4 is a reproduction of the radiogram taken one month after operation, and shows union at the point of fracture with beginning obliteration of the cysts as evidenced by the decreased translucency. Fig. 5 is the radiogram taken two months after operation, showing still further reduction of the cysts.

It is, of course, questionable whether or not the ostitis fibrosa was present previous to or resulted from the trauma of the first accident. From the comparatively slight traumata to which the limb was subjected in all three injuries, it seems more probable that the process had already begun prior to the injury 21 months before.

The cysts almost invariably occur in the metaphysis, near the epiphyseal line, but practically never invading the epiphysis itself. Situated most frequently in the upper or lower one-third of the shafts of the long bones of the extremities, it is five times more frequent in the proximal than in the distal ends, while in the humerus and femur it is situated at the shoulder or hip seven times to once at the elbow or knee.

Ostitis fibrosa, the underlying or primary stage of cystic disease, is undoubtedly an affection of the developmental age of bone. Thus in childhood and adolescence by far the greater number of cases come to notice. In Pfeiffer's 49 cases, 70 per cent. occurred prior to twenty years of age, and 85 per cent. before thirty. This is comparable to

FIG. 1.—Ostitis fibrosa cystica of second metacarpal bone.

FIG. 2.—Same as Fig. 1, after excision, showing transplant in position one week later.

FIG. 3.—Radiograph of Case II on admission. Shows the largest of the cysts and line of spontaneous partial fracture.

FIG. 4.—Radiograph in second case, male aged fourteen. One month after operation. Cavity filled with clot. Shows union of fracture and beginning obliteration of cysts. Shows other cysts.

FIG. 5.—Second case two months after operation. Shows almost complete resolution and obliteration of cavities.

FIG. 6.—Multiple enchondromata of both hands, showing cyst formation in first and second phalanges of fifth finger, right hand. Female, aged eighteen.

FIG. 7.—Radiogram in case of ostitis deformans of femur. Note great thickening and overgrowth of bone with rarefaction and eburnation occurring simultaneously. Male.

FIG. 8.—Radiograph in Case III. Fracture at site of cyst in base of proximal phalanx of index finger.

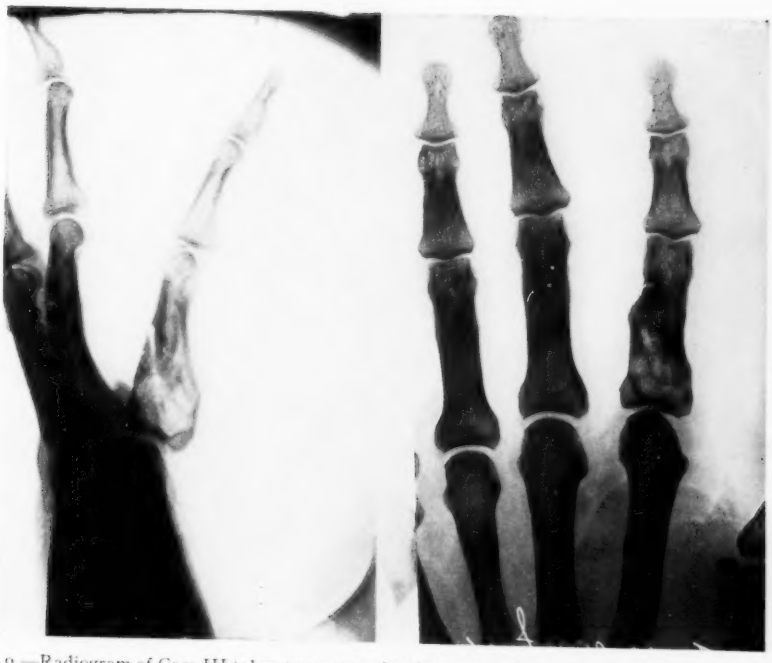

FIG. 9.—Radiogram of Case III taken two years after fracture. Practically no change in the cystic condition but perfect union of the fracture. Male, aged thirty-eight.

FIG. 10.—Osteomalacia. Female, aged one year. Shows cystic changes. Note involvement of epiphyses and of left tibia.

FIG. 11.—Osteomalacia. Discovered accidentally after radiograph for incomplete fracture caused by stumbling. Note compensatory hypertrophy of femur, bracket formation. Female, aged three.

FIG. 12.—Specific dactylitis. Involvement of epiphysis.

FIG. 13.—Medullary sarcoma upper end of humerus, with softening. Destruction of bone, fracture and involvement of soft tissues.

FIG. 14.—Radiogram of sarcoma of tarsus with beginning cystic changes in the centre.

Muller's series in which 67.5 per cent. were before twenty and 82.5 per cent. before thirty. In tabulating 97 cases, Silver found 67 per cent. between two and one-half and twenty years, while 77.3 per cent. were before thirty. Lack of detail in the reports of many cases probably places many of them at a much later age than they should be. The disease is so insidious, giving little or no disability and few symptoms, that it may be overlooked for many years. The youngest case reported was in a child of two and one-half—Silver had a case with onset at three years—while the average age of the 106 cases on record including the three reported here is twelve and one-half years. One sex is equally affected with the other.

The etiology of the benign bone cysts remains shrouded in obscurity. Various opposing theories without confirmatory evidence have been proposed. Thus Virchow believed them due to the softening of cartilaginous tumors. While cystic degeneration does undoubtably occur in chondromata, they cannot be considered identical with the cysts we are now dealing with. As Bloodgood states, " Cartilage is never present in sufficient quantity to justify the conclusion that the cyst is due to the liquefaction of a primary or original area of cartilage." Fig. 6 shows the radiogram of the hands of a patient, 18 years of age, suffering from chondromatous growths. They are identified chiefly from their multiplicity, their preference for the epiphysis and the peculiar mottled appearance so well illustrated in this specimen. Two of the growths, on the fifth finger of the right hand, have undergone cystic change.

Beneke likens these cysts to the apoplectic cysts of the brain, the hemorrhage, caused by an initial trauma, for some reason or other is neither absorbed nor does it become organized. Others, notably Lubarsch, and Röpke, believe that they result from infection. They have found organisms in the cyst contents. Von Recklinghausen in 1911 stated that most benign cysts were due to ostitis fibrosa, the solitary cysts to a localized form of this disease. As to the cause of ostitis fibrosa, von Recklinghausen believes that trauma or some mechanical factor is the important agent. Boit considers that it may result from various causes, infectious, metabolic, traumatic, toxic or perverted internal secretions. Rehn likens it to the snuffle disease of hogs, an overdevelopment of a normal process, while Bockenheimer believes ostitis fibrosa and Paget's disease one and the same, pathologically. Fig. 7 shows the radiogram of a case of ostitis deformans in a male well within the age of the occurrence of ostitis fibrosa. One notes at once the difference between this process and the latter, the extreme rarefaction

without the clear picture of cyst formation, the areas of rarefaction going hand in hand with areas of bone proliferation and eburnation, great thickening of the periosteum on the inner side and obliteration of the marrow cavity with true bone formation.

The balance of evidence is undoubtedly in favor of trauma as the initial factor in most cases. Thus in the 97 cases collected by Canaguier, the author states that trauma was known to precede the cystic formation in about two-thirds of the cases. Its occurrence during the developmental age when the bones are more susceptible to traumatic influences, and when repeated traumata are most frequent, their situation in the long bones which bear the brunt of blows and falls, and at positions in these bones receiving the balance of strain and where the cancellous tissue is most pronounced, all favor this explanation.

Benign cysts of bone like other chronic intramedullary diseases, have little symptomatology of their own, until they have progressed to the stage of causing interference in function, deformity, encroachment upon more sensitive structures, as the periosteum, causing pain, or so weakening the bone as to permit fracture from slight trauma. They may exist for years without giving any noticeable symptoms and be discovered accidentally by the radiograph. Most commonly the initial symptoms are local swelling or deformity. Pain is not a prominent symptom, when occurring is usually slight, often varies with atmospheric conditions, the so-called rheumatic type. When severe, some other condition should be suspected. Silver mentions pain as the initial symptom in 25 per cent. of his cases.

Fracture is the chief feature if not the most common symptom of cyst, as it is frequently the reason for seeking surgical aid. Fracture usually occurs spontaneously or by slight trauma and may recur with good healing in the intervals several times. Thus in a case recorded by Murphy in a boy aged twelve, with a cyst in the upper extremity of the humerus, the initial symptoms were slight variable lameness and tenderness, followed during the course of a year and a half by four incomplete fractures from slight traumata. In the 49 cases collected by Pfeiffer, pathological fracture occurred in 20. The following case is illustrative of the often symptomless course of this disease prior to fracture. I am indebted to Dr. G. V. Janvier, of Lansdowne, Pa., for opportunity of studying this case.

J. H., aged thirty-eight, a janitor. In May, 1912, he was holding a horse by the halter. The horse suddenly jumped, causing a sudden tightening of the man's grip in the halter ring, when he felt the index finger of his right hand suddenly give away. Pain, tenderness and disability were so great that he

consulted his physician, Dr. Janvier, who diagnosed fracture of the proximal phalanx and referred the patient to Dr. Pancoast for radiography. The radiogram (Fig. 8) shows an oblique splitting fracture of the phalanx running upward and forward through a cyst and entering the joint. This was the first evidence that a cyst existed. The patient had never to his knowledge injured this finger, had never had any pain, stiffness or tenderness in this hand and had always been in excellent general health. The fracture was reduced, kept on splints for three weeks, healed perfectly, and since then he has experienced no pain or tenderness. There is limitation of motion in flexion, this function is capable through an arc of only 45 degrees. This is probably due to involvement of the joint in the fracture. At present there is only slight enlargement of the bone. Fig. 9 shows the condition as it exists at present, perfect union with very little change in the cyst itself. Fractures involving cysts almost invariably undergo perfect union. Egg-shell crackling when the cyst has become so large as to be covered only by the thinnest shell of bone is sometimes encountered.

As stated in the beginning of this paper, the diagnosis of the benign cysts from other more malignant growths requiring vastly different treatment, is of essential importance. The characteristics distinguishing these benign lesions are their latent and long continued growth, with few or no subjective symptoms, their age of onset, their position most often in the extremities of the humerus, femur or tibia, never invading the epiphysis or joint, the frequency of spontaneous fracture, and the characteristic radiographic picture. The latter usually shows "a uniform, often egg-shaped, expansion of the bone, which gives the impression of having started from the middle and expanded equally in all directions; the central portion is definitely translucent to its very circumference, but mottled in varying degrees depending on the varying thickness of the cortex, the presence of ridges, or multiplicity of cysts; the cortex is thinned and narrow, but well marked and regular; the epiphyseal line is not involved."

From most other diseases of a benign nature the radiographic picture will differentiate. Figs. 10 and 11 show rarefaction and cystic change in osteomalacia, Fig. 11 disclosing a pathological fracture and the first intimation that other disease existed. Fig. 12 is of a specific dactylitis, showing overgrowth and thickening of the entire phalanx, distinctly different picture from that of ostitis fibrosa, which never shows bone proliferation and the enlargement takes place only from the expansion of a cyst if present.

The lesion of prime importance in the diagnosis is sarcoma and particularly the benign medullary sarcoma or myeloma. While the latter is still intramedullary, it may be impossible from the radiogram of differentiation from ostitis fibrosa cystica. Its more destructive rather than

expansive character, the early appearance of pain and interference of function, the more rapid growth, its irregular progression, indefinite outlines, its opacity, its early rupture through the periosteum and the involvement of surrounding parts, will usually aid in the diagnosis. Bloodgood states that no case of the more malignant forms of sarcoma of bone has come under notice after the process had been present more than two years—while in the benign bone cysts the symptoms bringing the patient to the surgeon are of much longer duration or unnoticed until the time of fracture. Figs. 13 and 14 show the characteristic appearance of sarcoma in the radiogram, Fig. 13 of the upper end of the humerus with destruction of bone, pathological fracture and invasion of the soft structures of the shoulder. Fig. 14 shows the growth involving the tarsus with cystic degeneration in the centre. The differing appearance of enchondromata has already been mentioned. Ostitis albuminosa has its own characteristics, the irregularity and moth-eaten appearance of the walls, the surrounding condensing ostitis, the usual periostitis and the probable presence of sequestra.

Appearances of a like nature, plus the history and the Wassermann reaction, usually serve to distinguish a centrally placed gumma. It should be remembered, however, that at times even with all the facilities of modern diagnostic methods and long experience, a correct diagnosis is impossible prior to exploratory incision which should be done in all cases of doubtful nature, hence the necessity on the part of the operator of having the necessary pathological training in recognizing these conditions microscopically.

The treatment of benign cysts is either watchful waiting, or operative. The former is rarely justified unless the diagnosis is absolutely assured. If the expectant treatment is adopted, proper support to the bone, the correction of any deformity, and the use of methods for stimulating bone production should be employed. Cysts have healed or disappeared without operative interference, some without but most of them after pathological fracture with drainage of the cyst contents into the tissues and very probably the filling of the cavity with blood and serum from the line of injury.

The operative treatment has varied, all with good results, from simple puncture and injection to excision of a whole or part of the diseased bone. Von Mikulicz aspirated a cyst through a small opening in the shell and injected iodoform emulsion with good results. Until recently the more popular treatment seems to have been exposure of the bone, crushing in the wall of the cyst to promote regeneration, and

curettement of the cavity, the remaining excavation may be allowed to fill with clot, or is packed with bone chips, Moorhof's bone wax or bismuth paste. Since the more frequent use of autogenous bone grafts, resection or excision of the diseased area has been more frequently done. Thus Murphy has resected in three cases, twice the upper end of the humerus and once the upper end of the tibia, and replaced the excised portions with tibial grafts. In a cyst of the femur at the hip, after thorough curettement, he placed a tibial graft in the remaining excavation. Canaguier resected the upper end of the humerus and grafted the tibial crest. Both operators have had uniformly good results. Ordinarily, however, except in the small bones of the hands or feet and in the hands of most operators, resection is not justified if the diagnosis is certain.

Conclusions.—1. Benign bone cysts are much more common than formerly supposed.

2. Limited as true simple cysts, they are distinct entities, most probably dependent upon a localized ostitis fibrosa.

3. The cyst is neither concomitant nor dependent upon other diseases.

4. They adhere more to the metaplastic picture than to the inflammatory or neoplastic, although they may result secondarily from a chronic attenuated inflammatory process.

5. Their etiology, unknown, seems in the large percentage of cases to be associated with trauma during the susceptible growing period of life.

6. They have little or no symptomatology prior to the stage of bone weakening, permitting spontaneous fracture or fracture from slight trauma.

7. Their chief importance lies in our ability to differentiate between them and other more serious lesions, mainly sarcoma, therefore recognition of their possibility, a careful history, local examination, with proper interpretation of the radiogram, are of the utmost importance.

8. The healing of fractures occurring at the site of cysts is uniformly good and may result in cure of the cyst.

9. Operative treatment, unless one can be quite sure from constant watching that the diagnosis is correct, is always justified.

10. Although in selected cases and in the hands of experienced operators, resection with autogenous grafting has resulted favorably, curettement, crushing in of the walls and primary closure of the wound have been almost universally sufficient to procure a cure.

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A REVIEW OF 100 CONSECUTIVE OPERATIONS FOR GOITRE WITH ESPECIAL REFERENCE TO THE TREATMENT OF HYPERTHYROIDISM*

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It is a rather significant fact that with the exception of Halsted, of Baltimore, no notable contributions on the surgery of the thyroid gland have been made by surgeons of the Atlantic seaboard towns. That this should have been so from the earliest days in the development of the surgery of the thyroid gland, I attribute to the geographical distribution of goitre, which is not so prevalent on the coast, but might be said almost to be endemic in regions following the great lakes from western New York and northern Pennsylvania into the territory of the great northwest. It is with some hesitation, therefore, that I venture to discuss the goitre question, and yet we are confronted sufficiently often with complicated problems to warrant a frank exchange of opinions.

Briefly, the review is based upon a group of 103 consecutive operations. I find there were 81 thyroidectomies, and 17 ligations of vessels, and 5 operations for thyroglossal cysts; more specifically there were 34 simple goitres, 29 adenomata, 1 sarcoma, 2 carcinomata and 32 hyperplastic (exophthalmic) goitres. There were 17 ligations, 8 of one and 9 of two vessels. Of the thyroidectomies, there were no fatalities, save one in the case of a large vascular sarcoma in a boy of 11 years. Of the ligations there were two fatalities in patients who, according to our more enlightened conception of the limitations of surgical therapy, would be now regarded as inoperable, at least in the acute phase at which the operation was performed.

Pathogenesis.—As to the pathogenesis of goitre of the endemic variety, there has been a popular belief for many years that in some way drinking water played an important part. This belief, based at first upon purely hypothetical grounds, is receiving more and more substantial support from thorough scientific investigations, the most recent and the most convincing of which is that of Allison, who maintains that the disturbance of thyroid function is derived from a chronic intestinal toxæmia.

* Read before the Philadelphia Academy of Surgery, April 6, 1914.

The etiology of Graves's disease—true exophthalmic goitre—has provoked much discussion, and the most fascinating theory comes from Crile, who believes it to be a disease of the motor mechanism, which may be induced by overstimulation of the nervous system, in time causing an overproduction of thyroid secretion. To quote Crile's own words: "Graves's disease is not a disease of a single organ or the result of some fleeting cause, but is a disease of the motor mechanism of man, the same mechanism that causes physical action and that expresses the emotions; its origin is in phylogeny, and its excitation is through some stimulatory emotion, intensely or repeatedly given, or some lowering of the threshold of the nerve receptions, this establishing a pathologic interaction between the brain and the thyroid."

There is little or no speculation on the part of those writing from the Mayo Clinic as to the factors which lead up to the definite pathologic changes which uniformly occur in exophthalmic goitre. It is regarded as a form of thyrotoxicosis in which the toxin, whatever may be its nature, acts directly on the more vital organs, more notably the central nervous and vascular systems, and that the clinical picture is made more complex by the interaction of those organs, whose functions have been directly disturbed by the toxin (Plummer). The most persistent and consistent opponent of thyroid hypothesis is Marine, whose work, because of its thoroughness and exhaustiveness, is always worthy of mention. Marine (*Journal of the A. M. A.*, lx, p. 325) believes that the thyroid hyperplasia of exophthalmic goitre behaves toward iodine as does any other thyroid hyperplasia of any animal thus far investigated. He even goes so far as to say that no specific or constant changes in the thyroid of exophthalmic goitre have as yet been demonstrated, that the iodine so far as it is at present known is identical with those iodine relations given to other clinical associations, and that the thyroid of exophthalmic goitre has no different pharmacological action on animals or therapeutic on myxœdema or toxic action on patients with exophthalmic goitre than thyroid preparations of other clinical associations with like iodine contents. These statements provoked a sharp criticism from C. H. Mayo, who insisted that Marine's observations lead him to conclusions not supported by surgeons of the present day. In further controversion of Marine's theory, Plummer stated (1) that hyperplasia of the thyroid never existed without a production of thyroid secretion in excess of the demands of the individual; (2) that exophthalmic goitre is a clinical entity associated with a definite pathological process in the thyroid; (3) that if hyperplasia of the thyroid is of a sufficient degree or extends over a long enough period,

exophthalmos is almost sure to develop; (4) that no matter how intense the intoxication from an adenomatous or colloid group not associated with hyperplasia, exophthalmos will not develop.

Classification.—For a proper understanding of the goitre question, especially with relation to the indications for operation, one must be familiar with various pathologic processes and with their clinical expressions. No more beautiful and convincing example of the advantages of the closest coöperation between the clinical and pathological departments can be found than in the extraordinary accuracy with which the diagnosis and prognosis of clinical manifestations of thyroid lesions can be substantiated and foretold by the pathologist's report. The pathologist's study of the thyroid gland has proven beyond a peradventure of doubt that exophthalmic goitre is represented by certain definite essential lesions in the thyroid gland. A few years ago there was, however, some confusion as to what constituted true Graves's disease or exophthalmic goitre, and Kocher maintained, and with some justification, that American writers were not discriminating enough in their classification, in that they include all types of hyperthyroidism with their cases of the true exophthalmic type. This criticism has borne fruit in the elaborate combined pathological and clinical studies of Wilson and Plummer, who, as a result of the studies of the material from St. Mary's Hospital, have elaborated a classification which bears the closest scrutiny and satisfactorily provides for the group of doubtful cases that were neither simple nor exophthalmic goitres. This classification divides all goitres, excluding those of a purely inflammatory or malignant nature, into 4 groups:

Group I. Non-hyperplastic atoxic—the ordinary colloid goitre or adenoma.

Group II. The non-hyperplastic toxic, representing 57.2 per cent. of the total number. There are two significant facts associated with this group. First, that 23.3 per cent. of the non-hyperplastic group presented some toxic symptoms, and, second, that there was an extraordinary difference between the average age at which these non-hyperplastic-toxic goitres appeared and the hyperplastic-toxic goitres of the exophthalmic type. In the former the average age was 22 years, in the latter 32 years. A still further distinction between these two groups is the significant fact that in the non-hyperplastic-toxic group (the simple goitre and the adenoma with toxic symptoms) the evidence of intoxication did not show itself until an average age of 36.5 years, that is, 14 years after the onset of the goitre, whereas in the true

exophthalmic type, the hyperplastic-toxic, the toxic symptoms appeared on an average within a year.

Group III. The hyperplastic-toxic represented 42.8 per cent. of the total number of specimens, and of these 99.2 per cent. had toxic symptoms. To this group belong all the cases of true exophthalmic goitre.

Group IV. The hyperplastic-atoxic, comprising but 1 per cent. of the total hyperplastic specimens, may represent a slight margin of error.

This classification, which conforms with extraordinary mathematical accuracy to the clinical syndromes of goitre, should, I believe, be adopted and serve as a working basis in the elaboration of our plan of treatment. In an analysis of my own records, I find that 35.7 per cent. belonged to the non-hyperplastic-atoxic group, 31.6 per cent. to the non-hyperplastic-toxic group and 32.6 per cent. to the hyperplastic-toxic group (see Table I).

TABLE I

Pathological diagnosis	Non-hyperplastic non-toxic	Non-hyperplastic-toxic	Hyperplastic-toxic	Total
Simple	20	14	..	34
Adenoma	12	17	..	29
Carcinoma	2	..	..	2
Sarcoma	1	..	..	1
Exophthalmic	..	..	15	15
Ligation cases	..	..	17	17
Total	35	31	32	98

Symptomatology.—The clinical picture of thyrotoxicosis has been so frequently described as to permit of no amplification. The relative frequency of the various symptoms is expressed in tabular form and calls for no especial comment. Mention might be made of an unusual phenomenon in one of the series—a periodic swelling of the upper lip synchronous with exacerbations of the disease and the development of a Bell's palsy. Whether the former was the outcome of some vasomotor disturbance of sympathetic origin is an interesting question. The Bell's palsy may have been incidental or perhaps toxic.

Surgical Aspects.—With these introductory remarks, I come to the consideration of the surgical aspects of goitre and will discuss the surgeon's responsibility with reference to these various groups, and first of all with reference to the non-hyperplastic, non-toxic type. By way of preface, I think one can truthfully say that goitre may be treated by both non-surgical and surgical measures. We must remember too that in the

life history of simple goitres there are certain structural changes which take place spontaneously, perhaps physiologically, as in pregnancy and menstruation, that is, without artificial measures, during which periods the gland may increase in size temporarily only later to diminish to one of inconspicuous dimensions. We should warn the practitioner against the effect of the administration of iodine or thyroid extract, either of which may induce toxic symptoms in a hitherto benign condition, a condition which Kocher styles as " iodine Basedow," an artificial Graves's disease evoked by the administration of iodine in nervous patients affected with goitre. If the treatment is persisted in the patient may die under the same circumstances as in spontaneous Graves's disease.

TABLE II

SHOWING SYMPTOMS IN TOXIC CASES

Pathological diagnosis	Cerebral symptoms	Vasomotor disturbances	Mental irritability	Tachycardia	Tremor	Exophthalmos	Cardiac insufficiency	Loss in weight and strength	Diarrhœa	Œdema	Headache	Jaundice	Vomiting
Non-hyperplastic-toxic (simple).....	1	2	10	10	9	3	10	3	1	1	2	..	..
Non-hyperplastic-toxic (adenoma)...	..	8	17	17	4	..	17	6	2	2	1	1	..
Hyperplastic-toxic...	..	4	15	15	6	14	10	5	6	2	2	2	2
Toxic cases in which ligation was performed.....	1	6	1	17	10	16	12	7	9	3	1	..	6
Total.....	2	20	59	59	29	33	49	21	18	8	6	3	8

When consulted by the patient with simple goitre, colloid or adenoma, as to the propriety of operation, I present the situation somewhat as follows: that the operation is peculiarly free from danger, that the patient must decide for herself whether the swelling is enough of a personal annoyance to warrant its removal, that there is a tendency in a considerable number of cases for simple goitres to undergo certain changes which will affect the heart and nervous system, and eventually lead to permanent damage of the heart, kidneys, and liver; that in exceptional instances in later life goitres become cancerous. This, to my mind, is a fair presentation of facts based not only on my own experience, but on the statistics of large groups of cases. As to the risk of operation, there were no fatalities in my own series of partial thyroidectomies; in larger series we find the mortality in 561 cases, in the Clinic of the St. Mary's Hospital in 1913, to be 0.18 per cent. Of the

chances of a thyrotoxicosis developing in simple goitres, the statistics from my clinic give a percentage of 41.1, while from the Mayo Clinic the percentage was 23. To put it in another way, one in four or one in three patients with simple goitre will develop a symptom-complex which in many respects, both as to the clinical picture and as to the gravity of the disease, is so closely analogous to true exophthalmic goitre as to be almost indistinguishable. With the exception of three or four of the true exophthalmic type, one of the most gravely sick in my entire series belonged to this group.

> The patient (file No. 14421), referred to me by Dr. A. R. Johnson, of New Bloomfield, Pa., was forty-six years of age; 14 years ago the goitre first appeared, but there were no associated symptoms until 9 years later, when she developed shortness of breath, tachycardia, palpitation, diarrhœa, loss of weight and strength, and nervousness. The patient was emaciated, extremely nervous, her heart was dilated, the pulse was most irregular, and tachycardia extreme. She was given a short course of preparatory treatment, the left lobe was removed, and the superior thyroid artery ligated on the opposite side. Apart from an attack of acute dilatation of the stomach her convalescence was uninterrupted. The histological study showed no evidences of hyperplasia, the pathological diagnosis being colloid goitre with evidence of hemorrhage into the interstitial tissue and between the glandular acini.

Finally, as to the incidence of malignant degeneration of simple goitres, this is an important phase of the subject because, when malignancy can be recognized by the physical signs, the tumor has attained the inoperable stage in most cases. In my records there were five cases of malignant disease; three of these were recognized clearly as such before the operation, and the remaining two were recognized in their incipiency only by the microscope. One of these (File No. 25777) was found in an adenoma removed from a patient thirty-six years of age, who had had a goitre since she was eighteen, and began to develop symptoms of hyperthyroidism 14 years later, for the relief of which the operation was performed. The second case (File No. 14422), referred to me by Dr. William Glosser, of Williamsport, Pa., developed a goitre at the age of twenty-one, after the birth of her child, and from that time to the present she has had some disturbance of her circulatory and nervous system. The right lobe was removed and the pathologist reported adenoma with beginning malignant degeneration. The incidence of carcinomata is, therefore, a matter which must not be overlooked in the argument for or against operation.

In discussing the selection of cases of the toxic group for operation, I will include both those of hyperplastic and those of non-hyperplastic

origin, for while the higher percentage of more serious cases will be found in the hyperplastic group, cases equally as serious but in smaller numbers will be found in the non-hyperplastic. We must assume at the outset that in most cases the toxic goitres run an essentially chronic course, to be sure with considerable variations and more or less frequent explosions, and that it has its fatal tendencies. That the mortality is high in unoperated cases is usually not appreciated by the general practitioner. In one family under my observation the elder daughter (File No. 521) developed exophthalmic goitre and the physician and consultant strongly opposed operation. She died four years later at the age of 30—death was sudden and the doctor pronounced the cause of death as "apoplexy." Two years after that her younger sister, who had symptoms of hyperthyroidism (File No. 6650), was referred to me by the same physician for operation. The lesson had been learned, though at the cost of a human life.

For the sake of convenience we may distinguish between cases of a moderate severity and those of a more serious nature. Our advice to the cases of moderate severity depends upon their financial and social status. If conditions are such as to make it impossible to undergo an adequate course of treatment with the necessary physical and mental rest and perhaps change of environment, and if it will be necessary for the patient to return immediately after her treatment to conditions of employment which would predispose to relapses, we strongly urge immediate operation. In a number of mild cases, prolonged courses of treatment under competent physicians had been ineffectual and operation had to be resorted to. There have been no deaths in this series, and the results have been almost uniformly satisfactory.

As to the cases of more grave character, our plan has been not to give an opinion until the patient has been under observation for a week with absolute rest. Many of these cases come from a distance, are fatigued by travel, and are in a state of nervous excitement at the time of the first examination. They are put to bed and the condition of the cardiovascular system carefully studied. Usually within a week the condition will improve sufficiently to justify operation, or at least to determine with greater intelligence the mode of treatment to be adopted.

What should be considered contra-indications to operation? Kocher (*Brit. Med. Jour.*, October 1, 1910) regards chronic nephritis, enlarged thymus, and glycosuria as contra-indications, and in his writings lays great emphasis upon lymphocytosis and a decrease in the polynuclear cells as an index of the gravity of the case. In the blood analysis of my cases, I have not been able to confirm this statement. The follow-

ing summary is taken from my records and, for the sake of comparison, the cases have been divided roughly into two groups, the grave and the moderate, in accordance with the clinical picture:

Highest of grave cases	55
Highest of moderate cases	38
Lowest of grave cases	15
Lowest of moderate cases	21
Average of grave cases	30.2
Average of moderate cases	27.6

From these it will be seen that the degree of lymphocytosis did not bear any constant relation to the severity of the case or to the prognosis. The condition of the myocardium has served for me as the most reliable guide.

The acute exacerbations, the explosions of hyperthyroidism, should be regarded as a positive contra-indication. A dilated heart, failure of compensation, poor muscular sounds, are the danger signals, and will determine whether operation must be deferred or altogether abandoned. Had I recognized this condition and observed this stricture, I would not have operated when I did on one of my two fatal cases.

> The patient (File No. 10286) was forty years of age, the symptoms were only of six months' duration, the heart action was extremely irregular (delirium cordis) and the heart dilated, tachycardia was marked, the vessels of the neck pulsating, restlessness extreme, the urine contained albumin and granular casts, the legs were œdematous, and there was some ascites; the hæmoglobin was 75 per cent. and there was a lymphocytosis of 27; respirations were rapid, and the thymus gland was enlarged. This was a case running an acute course, with a dilated heart, failure of compensation, chronic nephritis and an enlarged thymus. Both superior thyroid arteries were ligated under local anæsthesia preceded by scopolamine and morphine; the patient died 5 hours after the operation. This happened two years ago. To-day, the operation, if performed at all, would have been deferred until the patient's condition had improved, one instead of two vessels would have been ligated, nitrous oxide anæsthesia would have supplanted local, and anoci-association would have been included in the preparation.

In the non-toxic varieties, our technic comprises the Kocher collar incision, separation in the midline of the sternohyoid and thyroid muscles, the high division of one pair or the other, if necessary, the removal of one or one and a part of another, always leaving the posterior capsule *in situ* to avoid removal of the parathyroid glandules (subcapsular lobectomy). The muscular layers including the platysma are closed with interrupted catgut sutures, and the skin with horsehair.

Drainage is the rule. In the toxic variety, the patients are admitted to the hospital with the understanding that if an operation seems advisable full consent is given to perform it at such time as the surgeon thinks best. Thereafter the subject of operation is never discussed in the presence of the patient or nurses; the patient is put to bed immediately, given seven minims of tincture of belladonna t. i. d., and an ice-bag applied to the neck or precordium and the formula for stealing the gland according to Crile's technic adhered to closely. This includes a rectal irrigation at 7.30 A.M. daily, a hypodermic of sterile water at 8 A.M., an " inhalation treatment " at 9 A.M. by the anæsthetist, and breakfast at 9.30. On the morning of the operation, an enema is given at 7.30 A.M., scopolamine gr. 1/200 at 8, morphia sulphate gr. 1/6 at 8.45, and at 9 the anæsthetist begins with the inhalation treatment and substitutes nitrous oxide, under the influence of which the patient is brought to the operating room.

I am thoroughly convinced of the advantages of anoci-association, although my practice of it is limited to the avoidance of harmful psychic stimuli before the operation. The infiltration of the wound with cocaine, quinine, and urea has seemed to complicate wound repair, and I believe can be dispensed with as relatively unimportant. At least since I have abandoned it the immediate results have been equally good, and the cosmetic effect better. While the elimination of harmful psychic excitation should be taken into consideration, is it not true that after the patient's confidence is thoroughly won, the mere thought of operation begins to lose its terror and thus the surgeon's personality counts as a factor in the working out of anoci-association? In one case I tested out the patient before the operation (File No. 24984). The superior thyroids and one inferior thyroid had been ligated at two sittings at intervals of several months. On her third admission the patient was sent for in the course of the morning clinic; I discussed the treatment in her presence before a group of students, told them what had been done for her, how much she had been improved, that further treatment would be required. The patient, during the months of her struggle for health, had come to place implicit confidence in me. I watched her carefully during this discussion and observed that she was comparatively calm and that her pulse was not accelerated by the ordeal. When asked whether she would like us to go on with the next stage of treatment, she expressed her readiness, climbed on the operating table, and I at once removed one lobe under nitrous oxide anæsthesia. She has finally recovered her health, and when last seen her pulse was 68 on sitting and only 80 after exertion—a complete transformation from

her former debilitated state. This is an example of what I mean by the application of psychic influence in the treatment of Graves's disease, which unquestionably is a factor of great importance.

With reference to the advantages of scopolamine in all cases, I have been a little skeptical. At least in some cases it seemed to have a disturbing rather than sedative action. In two cases particularly the pulse was accelerated, and the patients became extremely restless and in one instance delirious. In this case, the operation was postponed because of this extreme excitation; at the time set for the operation two weeks later the scopolamine was omitted and this condition of excitation did not occur. In most of the toxic cases and in all the more serious ones, nitrous oxide anæsthesia has been used, and I believe to advantage. The choice of operation must be left to the individual judgment of the surgeon. My rule has been to err always in favor of conservatism, to choose in doubtful cases ligation rather than lobectomy, one vessel rather than two, or in the more serious cases injection of boiling water rather than ligation. While I have had no experience with the latter I am convinced from the reports of Porter (*Jour. Mich. State Soc.*, February, 1913) of its usefulness. The only two cases which died in the hospital as the result of operation were double ligation, and in looking over the records, I can clearly see the wisdom of substituting boiling water injections at least as a preliminary treatment for ligation. I have practised ligation 17 times in 14 patients. In 9 both superior arteries were ligated, in 3 the right superior, in 4 the left superior, and in 1 the left inferior. Five patients were operated upon twice and one three times, as follows:

First operation	Second operation	Third operation
1. Ligation right superior thyroid	Lobectomy.	
2. Right lobectomy	Ligation left superior thyroid.	
3. Ligation both superior thyroids	Ligation left inferior thyroid	Right lobectomy.
4. Ligation both superior thyroids	Right lobectomy and ligation of left superior pole.	
5. Ligation right superior thyroid	Ligation of left superior thyroid.	
6. Ligation of both superior thyroids	Right lobectomy and ligation of left superior pole.	

Halsted's (*Trans. Am. Surg. Assn.*, 1913) preference of ligation of the inferior over the superior thyroid artery deserves consideration, and while from the purely technical consideration and the cosmetic effects he has made out a strong case in favor of the inferior thyroid, I

still favor the superior thyroid, because of the greater facility of including in the ligature not only the vessels but the nerves, a technical point of which Crile has explained the importance.

Results.—Of the 103 operations, there were 80 thyroidectomies with no deaths. Of 3 thyroidectomies for malignant disease, there was

TABLE III

FINAL RESULTS IN 37 CASES PRESENTING TOXIC SYMPTOMS WHICH HAVE BEEN RECENTLY HEARD FROM

Pathological diagnosis	Entirely well	Greatly improved	Moderately improved	No improvement	Total
Non-hyperplastic-toxic (simple)	2	1	2	..	5
Non-hyperplastic-toxic (adenoma)	5	5	2	..	12
Hyperplastic toxic	5	7	1	..	13
Toxic cases in which ligation was performed	3	3	1	..	7
Total	15	16	6	..	37

one death, a sarcoma in a boy eleven years of age. Of the 17 ligations, there were two deaths, both true exophthalmic goitres, one an acute case of six months' duration already referred to, the other a case in the terminal stage of the disease.

TABLE IV

SYMPTOMS IMPROVED SINCE OPERATION IN 30 CASES RECENTLY HEARD FROM

Pathological diagnosis	Mental irritability	Palpitation	Ocular disturbance	Weight	Strength	Diarrhœa	Dyspnœa
Non-hyperplastic-toxic (simple)	4	2	..	4	4	..	3
Non-hyperplastic-toxic (adenoma)	9	9	1	7	7	..	2
Hyperplastic-toxic	11	9	10	10	10	4	7
Toxic cases in which ligation was performed	4	3	4	4	4	4	3
Total	28	23	15	25	25	8	15

The end results in the toxic cases were in accordance with those recorded from other clinics. Of the patients heard from, 90 per cent. had fully recovered or were greatly improved and of the latter a number had been operated upon within the last year. The complete-

ness of the cure does not depend entirely upon the successful removal of the gland. Two other factors must be considered: first, the care of the patients after the operation which should, whenever possible, free the patient from physical and nervous strain for periods varying from several months to two years. Unfortunately, the social status of the patient may make it impossible to provide these conditions sometimes. This must be borne in mind by the practitioner into whose hands the patient falls after operation, and the completeness of the recovery will depend upon his appreciation of the need of this after-treatment and whether the circumstances permit of its enforcement. Second, the existence of chronic visceral disease at the time of the operation must be taken into account. Some of these patients are physical wrecks with organic lesions of heart, kidney, and other organs, from which complete recovery is impossible. As Kocher (*Brit. Med. Jour.*, February 17, 1912) has said, if all cases were operated upon within a short time after the outbreak of the disease, they would probably all be cured and to this might be added that the mortality, low as it now is in all cases, would be reduced to that of as common a procedure as herniorrhaphy.

The general practitioner has every right, if he so chooses, to try nonsurgical means in the early stages of the disease before the myocardium or kidney or nervous system is permanently damaged. But if he fails to arrest the disease and does not advise operation in the curable stage, he should be just as severely censured as the practitioner who fails to call for surgical aid until his patient with acute appendicitis has developed peritonitis, or one with a callous ulcer of the stomach, carcinoma. The conditions are quite parallel. The extraordinary recuperative power of patients with Graves's disease is amazing, and in most cases, sick as they are at the time of operation, they will almost uniformly be restored to perfect or reasonably good health.

CHRONIC CYSTIC MASTITIS*

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It would serve no useful purpose to review in detail the historical data concerning the progress of knowledge concerning chronic cystic mastitis. The attention of surgeons was first directed towards this disease particularly by Koenig, Reclus and Schimmelbush. About a decade ago, Greenough and Warren in this country published the results of their study upon a large series of cases. In this Academy, Speese and Taylor have reported series of cases and have paid particular attention to the relation of carcinoma to chronic cystic mastitis. Additional interest has recently been given to the subject by the publication of a clinical paper by Judd (*Jour. Mich. State Med. Soc.*, 1914, i, p. 11) and one by MacCarty (*Surg., Gynec., and Obst.*, 1913, xvii, p. 441) upon the pathology, both from the Mayo Clinic. It has seemed worth while to the writer to report the results of eighteen cases operated on in Dr. Frazier's clinic in the University Hospital in which the diagnosis of chronic cystic mastitis was made by the pathologist with occasional reference to the occurrence of epithelial hyperplasia. I have excluded those cases diagnosed as chronic cystic mastitis and carcinoma; they have been included with the cancers, and the early cases were reported to this Academy in 1909 by Dr. Speese (Annals of Surgery, 1910, li, 213).

It is not necessary to discuss the changes occurring in the normal breast at the time of involution, nor is it necessary to dilate upon the fact that this disease is believed to be due to certain abnormal changes occurring at this time.

The term chronic cystic mastitis is open to certain objections and that this has been realized by various writers is evident by the fact that there are twelve synonyms for the disease, no one of which seems perfectly satisfactory.

When examined grossly these breasts show an increase in the fibrous tissue generally throughout the entire gland, but more dense in certain areas or about certain lobules. It varies from white to gray in color and in many cases is of cicatricial consistency. Cysts are present

* From the Service of Dr. C. H. Frazier in the University Hospital, Philadelphia. Read before the Academy of Surgery of Philadelphia, April 6, 1914.

in every case, occasionally in microscopic dimension only, but as a rule varying in size from a few millimetres up to several centimetres. They contain fluid varying in color from clear watery fluid through all shades of yellow and green up to black. Histologically, the fibrous tissue is found increased, especially that derived from the interlobular connective tissue; a round-cell infiltration is frequently observed; the large ducts are occasionally compressed; the acini in the lobules vary considerably in size and their lining epithelium shows various stages of proliferation. It is this variation in the epithelium which has given rise to much discussion and which at times suggests or indicates the histologic picture of cancer. To discuss the matter in the language of Greenough or of Warren we see two types of the disease, those in which the changes are distinctly cystic with flattened, atrophic epithelium and those in which proliferation is a characteristic feature with varying degrees of hyperplasia of the epithelium, even to the formation of adenomatous areas. MacCarty calls attention to the fact that the secretory cells of the primary acinus, composed of one row of columnar or cuboidal cells, rests upon another row of cells almost invisible in the normal breast but prominent when there is a chronic inflammatory reactive process present, and which corresponds to the so-called *stratum germinativum* of the skin and constituting the germinal cells of the epithelium of the breast. These will be referred to as the outer cells and the first mentioned as the inner cells. When both are present he terms the histologic picture a primary epithelial hyperplasia; the inner cells disappear and there remain only the hyperplastic cells of the outer row. This condition will be referred to as secondary epithelial hyperplasia, and he states that it may be frequently seen in chronic cystic mastitis and may or may not be malignant. When the cells of the outer row appear in the periacinal stroma, the condition may be spoken of as tertiary or migratory hyperplasia and is, of course, carcinoma. MacCarty believes that we should determine the percentage of cases of secondary hyperplasia which will remain well or will recur after the removal of the primary gland itself without the removal of the lymphatic gland, muscles and large amounts of skin.

I have examined the slides of 14 of our cases for the purpose of classifying them according to the MacCarty scheme. In nine the hyperplasia was of the primary type, *i.e.*, the growth was benign. In the tenth case the patient was operated on three times, twice in the left and once in the right breast, and in all three neoplasms primary hyperplasia only was found. In the eleventh case the mass in the left breast was excised subcutaneously and revealed the secondary type of

hyperplasia, while a growth in the right breast removed two years later was of the primary type. In another case the right breast was removed in 1904 and showed primary hyperplasia. Six years later a mass was removed from high in the upper outer quadrant, the remains of the breast, and showed a secondary hyperplasia. In two other cases the secondary type of hyperplasia was encountered. Of the four secondary hyperplasias, *i.e.*, the type which may or may not be carcinomatous according to MacCarty, three of the patients were traced and reported cured five years, four years, and three years, respectively, after operation. Of the ten primary hyperplasias, eight have been traced and all reported cured. The tertiary hyperplasias or carcinomas are not reported because we include them under the cancers.

While this series is entirely too small to draw important deductions, it is interesting to note that the average age at operation of the patients with primary hyperplasias was thirty-six; of the secondary hyperplasias, forty-one.

The clinical features of this disease are well known by most surgeons, although it has been my experience that most men in general practice have rather vague ideas upon the subject, and this cannot be wondered at considering the confused nomenclature and varied descriptions of the pathology. The malady affects the breasts of women at an average age of forty years, may involve one or occasionally both breasts, is associated with a certain amount of pain, occasionally referred down the arm, and upon examination a rather vague mass is felt, containing one or more hard nodules, and which is not adherent to the skin or to the underlying pectoral fascia. Examination of the axilla rarely reveals any enlargement of the nodes there. In Judd's recent paper he reports 218 cases of chronic cystic mastitis, eleven occurring in males, of which 85 per cent. occurred during the "cancer age" (30 to 60 years). The greater number of cases gave a history of having had previous mastitis and nearly all of them complained of pain. In our series pain was the exception rather than the rule, and 89 per cent. were between 30 and 60 years.

TABLE I

AGE INCIDENCE

	Cases
Between 10 years and 20 years	1
Between 20 years and 30 years	2
Between 30 years and 40 years	5
Between 40 years and 50 years	9
Between 50 years and 60 years	1

The youngest, fifteen years (male); the oldest, fifty years. Average age, thirty-eight years, eight months. Married, fifteen; single, two; male, one. Ten had borne children; four were childless. The menstrual history was of no importance in any case.

In the family history the occurrence of cancer was noted in five instances, tuberculosis twice, and in one of these both tuberculosis and carcinoma were present in the family history. Only two patients of the eighteen stated that they had injured the breast and both ascribed the mass to the injury. In only one case was there a previous history of acute mastitis and in this patient there was also a history of trauma. Four of the patients, at least, were ptotic.

The duration of the disease was very variable and any statements on this point would be inaccurate because often the patient would state that the "lump" had been present for a few weeks or months when it probably had existed for a longer period. One patient had only noticed the mass for three days and immediately came for operation. Another had noted the mass for five years and still another stated that she had had masses in the breasts ever since she was a little girl.

Of these 18 patients a definite, satisfactory letter has been received from 15, and in all of them cure has evidently occurred. The period of cure varies from eight months to nine years and seven months and may be tabulated as follows:

TABLE II

INCIDENCE OF CURE

	Cases
Eight months to three years	4
Three years to six years	5
Six years to ten years	6
Not traced	3

Treatment.—In discussing the treatment of chronic cystic mastitis we are confronted by the statistics of 295 cases collected by Speese (ANNALS OF SURGERY, 1910, li, 213) in which the diagnosis of cystic mastitis was made and the subsequent pathological examination revealed carcinoma in 15 per cent. In 1910 Dr. Taylor (ANNALS OF SURGERY, 1910, lii, p. 253) reported before this Academy 26 cases in which the diagnosis of chronic cystic mastitis had been made of which 50 per cent. showed carcinomatous degeneration. We are also confronted with the statement from the Johns Hopkins Clinic that if we remove a mass from the breast which upon microscopic examination turns out to be carcinoma, the patient will almost inevitably die within the three-year limit even though the secondary complete operation is performed a

few days later. On the other hand, Judd from his experience with 218 cases reports that in 211 a conservative operation was performed and in none of the cases was there found evidence of malignant degeneration. In the remaining seven cases of doubtful malignancy the radical operation was performed. It is not stated in his report whether this examination was made from frozen section at the time of operation or whether it was made later, but both Judd and MacCarty state that in the experience of the Mayo Clinic the removal of the mammary gland preceding an immediate radical operation has not been associated with earlier recurrence than has been found after a primary radical operation. In the discussion (ANNALS OF SURGERY, 1910, lii, 253) before this Academy in 1910, Dr. Taylor stated that, as a rule, he would remove the whole gland in a case of carcinoma except that the muscle is allowed to remain unless the tissues of the breast appear macroscopically uncertain. Gibbon would practise complete removal only when the disease had existed for a long time, where there were multiple cysts or where there was recurrence, after operation. Ross removed the gland subcutaneously and Rodman was partial to Warren's operation if there were a competent pathologist at hand to make a frozen section report. The plan of treatment recently suggested by MacCarty deserves consideration. He believes that in the doubtful cases in women near or over thirty-six years of age, they should have the entire mammary gland removed for immediate examination. If primary or secondary hyperplasia be present nothing more should be done; if tertiary hyperplasia be present a radical operation should be performed. In doubtful patients near or under thirty-five years of age a wide section of the gland should be removed, and if primary hyperplasia be present nothing more should be done; if secondary hyperplasia be present the remainder of the gland should be removed, and if tertiary hyperplasia be present the radical operation should be performed. Judd slightly varies this procedure and advises, in women under twenty-seven years of age, partial excision preferably by the Warren method; in those between thirty and forty years he believes that the radical operation is the surest method but prefers for cosmetic reasons to practise partial excision and to abide by the decision of the pathologist, doing a radical operation at the time if necessary. In patients between the ages of forty and sixty a radical operation should be performed but the muscle need not be removed in definite benign conditions.

In our own series of cases, resection of a portion of the gland was performed seven times; in one of these the breast was completely amputated and the axilla dissected out because of apparent recurrence

two months later and we were fearful of carcinoma; no microscopic evidence of carcinoma, however, was found in either specimen, but unfortunately the patient has not been traced. In a second case the resection was followed two and a half years later by a subcutaneous excision of the entire breast for apparent recurrence. This patient returned a little later for a similar condition in the opposite breast which was also excised subcutaneously. She reports herself at the present time as being entirely well, and, curiously, on January 31, 1914, gave birth to a daughter, at which time the tissues over the chest were tender and there was a slight discharge from the nipple. Excision of the breast was performed in the remaining eleven cases, in one being accompanied by a dissection of the axilla, and in another a radical operation was done two years after the excision. Both these cases have been traced and are perfectly well. One patient who had both breasts operated on with a complete amputation on one side and a subcutaneous excision on the other much prefers the former operation, stating that the remaining nipple is quite tender.

I have called particular attention to these recent statements of Judd and MacCarty, because every one is familiar with the older literature and perhaps even the new does not offer anything in the way of progress. There have been a number of papers written upon malignant degeneration or carcinomatous changes in chronic cystic mastitis and Judd makes the statement that chronic cystic mastitis is a precancerous condition. No one has ever seen the direct transformation, however, and it is only by tracing the border-line cases, the secondary hyperplasias of MacCarty, that we are able to determine in just what cases a radical operation should be done and in which cases a conservative one performed. There is no reason why chronic cystic mastitis could not be produced by the pressure of the carcinoma cells together with the fibrous hyperplasia that always accompanied this disease, and therefore a result, not a cause, of the cancer. It may be coincident.

The two diseases are closely interwoven, however, and any tendency to conservative treatment in women over thirty years of age is to be deprecated.

In conclusion I wish to express my indebtedness to Dr. Frazier for permitting me to collect and report his cases as well as for the privilege of using his wards for my own patients and in some instances for operating on his patients. I have had six patients suffering from chronic cystic mastitis operated on in other hospitals and Dr. Frazier has had a number of cases in the Episcopal Hospital, but we have thought it best only to report the series in the University Hospital.

INDICATIONS FOR AND VARIATIONS IN THE TECHNIC OF ECK FISTULA*

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The production of an artificial communication between the vena cava and portal vein for the relief of certain pathological conditions was first described by Eck in 1877 and therefore bears his name. He suggested the operation especially as a remedial measure in cases of cirrhosis of the liver with abdominal ascites. He never attempted the operation on man, however, as his mortality with animals was rather high. Numerous technics have since been elaborated, several of which are quite uniformly successful. Probably the best known of these is the one described by Carrel and Guthrie, which with slight modifications has been used in all our experimental work.

The operation has been performed twice on man. The first was by Vidal in France, the report of which he published in *La Semaine Medicale* in 1903. The patient had cirrhosis of the liver, and was apparently benefited by the operation, but died four months later from an "endovascular infection of enteric origin."

The second operation was performed by P. Rosenstein, who reports it in the *Zentralblatt für Chirurgie,* Leipsic, February 28, 1914. His case also had cirrhosis of the liver with marked ascites, necessitating frequent tappings. He first tried omentopexy, but without gaining any relief. He next performed an Eck fistula operation which he says only gave temporary relief, tappings having to be resumed a short time after. He next tried drainage into the urinary bladder through a valvular opening. This, he reported, gave almost complete relief. He does not describe his technic for the Eck fistula and it is very possible that the portal pressure was not sufficient to keep the anastomotic opening patent. We have observed this in dogs when the portal was not ligated above the anastomosis. It is also possible that the communication between the portal and vena cava was not sufficiently large. In one of our dogs this mistake occurred and when the animal was killed about

*Read before the Philadelphia Academy of Surgery, April 6, 1914.

three months afterwards, a marked dilatation of the vessels in the entire portal system with compensatory circulation was found, although the anastomosis was still patent. The opening practically always contracts to a certain extent and in his case, while it appeared sufficient at first, may have contracted below the physiological limit for adequate functioning. We have also observed this in our experimental animals. Several surgeons, especially in this country and in Italy, have opened the abdomen with the expectation of performing an Eck fistula, only to find the adhesions so dense around the hilus of the liver and the portal vein and vena cava that the operation could not be performed. Dr. Frazier and I recently opened an abdomen with the object of performing an Eck fistula, but the adhesions throughout the entire abdomen were so extensive that it was impossible to reach any of the larger veins.

Experimental work on dogs and cats has amply proved the procedure feasible, and that comparatively little danger exists in the operation itself. The animals remain healthy, usually gain in weight as normal animals should, and at least when on a normal mixed diet show no toxic symptoms whatever.

Indications for Eck Fistula.—Cirrhosis of the liver with ascites, for which condition the operation was first devised, still offers the principal field for its employment. Those cases with an alcoholic history and without serious changes in other organs are probably the most favorable for this procedure. In those cases in which an attempt at compensatory circulation exists, shown by the so-called "caput medusæ" and by enlargement of the œsophageal and hemorrhoidal veins the operation is particularly indicated, since the greatly enlarged veins, particularly in the œsophagus, are prone to rupture at any time. This is so often fatal that indications for its relief completely overshadow those for the simple improvement in the ascites. The operation of Eck's fistula offers, at least theoretically, the most promising relief for the impending œsophageal hemorrhage, in fact offers the only immediate relief from danger. But it would be much better to operate in the early stages, when ascites is the only complaint, than to wait for the most serious of the sequelæ.

The Talma-Morison operation of epiplopexy or omentopexy offers in the early stages of hepatic cirrhosis a simple method for the relief of ascites and in many cases has afforded marked improvement, some even claiming a cure of the ascitic condition. It is certainly a question in the early stages, which operation, epiplopexy or Eck's fistula, should be the choice. The mortality from the former has been very high, but

principally, I think, because it was performed too late in the disease, considerable shock resulting from the extensive irritation of the peritoneum. The mortality from the Eck fistula operation should be small, especially if done early, as there is actually very little trauma to the peritoneum. The two cases in which it was performed suffered no ill effects from the procedure. Omentopexy affords very little relief in the late stages when the œsophageal varices have formed, so that in this condition we can offer little hope except by an artificial, direct anastomosis between the portal and caval systems.

Cirrhosis due to stasis in the hepatic veins, so-called nutmeg liver, the liver of chronic congestion, is often associated with ascites, but in this case neither omentopexy nor Eck fistula could be expected to afford relief since the trouble lies, not in the portal, but in the vena cava itself. The pressure in the latter is so high that stasis occurs in all its tributaries, and the flow through the portal is more or less dammed back. These cases are usually associated with marked valvular lesions in the heart and no surgical procedure except drainage of the ascites can be offered.

In Banti's disease we apparently have a primary splenomegaly with a secondary cirrhosis of the liver. In this condition Eck fistula should give complete relief from the portal obstruction and resulting ascites. A fourth class of patients which could be materially helped by Eck fistula are those suffering from thrombophlebitis of the portal vein. The etiology of this condition varies considerably, but probably most cases are due to syphilis and to primary or secondary cryptogenic pyogenic infections. The vein shows a phlebosclerosis upon which thrombi form, more or less occluding the lumen. Occasionally complete obstruction occurs and unless canalization soon takes place the portal obstruction proves fatal. The splenic veins are also involved in many of these cases. Indeed, Warthin considers this the primary factor in the etiology of Banti's disease. Obviously, the classical Eck fistula operation could not be done in these cases, since the portal may be more or less diseased for the greater part of its length. In this class of cases we would make the anastomosis between one of the larger mesenteric veins and the vena cava or if more convenient on one of the common iliacs. Certainly omentopexy in this condition could not be expected to give the relief which a modified Eck fistula would afford.

Those cases of ascites due to nephritis or serious cardiac lesions would not be benefited by either omentopexy or Eck fistula, repeated tappings or drainage into the parietal tissues being the only surgical measure advisable.

Technic of Eck's Fistula.—A simple method for lateral venous anastomosis which did not involve an exposure of the opened vessels was described by Sweet in 1904. In his method a posterior row of sutures approximating the portal and vena cava is laid, similar to the posterior row in a gastro-enterostomy. Two needles bearing a fine platinum wire are then passed through the lumen of the vessels from above downwards, the position of the wire determining the location and size of the anastomotic opening. The anterior layer of sutures is then placed, completely closing, except at the lower end where the wire emerges, the space through which the anastomosis will be made. The wire is then connected to a special holder and an electric current passed through it. Careful traction is now made, and the wire, acting as a cautery, rapidly cuts a communication between the two veins. When the wire emerges at the lower opening a very little blood escapes, which is immediately controlled by tying the last suture. This effectually closes the lower opening.

Bernheim in 1912 published a technic quite similar. Instead of employing the electric cautery he used a special type of scissors armed with a guard. Previous workers, including Eck and Pawlow, have used practically the same method, with the exception of the guard on the scissors. Bernheim claims that with these special guarded scissors it is impossible to injure the outer walls of either vein, and the size of the cut can be made with mathematical exactness.

It is interesting, when we consider that in this operation no attempt, other than the exclusion of the air, is made to prevent clotting, that no thrombus occurs. The volume and rapidity of the blood stream seem to be sufficient to prevent any accumulation of erythrocytes upon the thin layer of fibrin which always forms on the cut edges. This is one factor strongly in favor of the operation on man, since it minimizes the greatest danger of the operation, that of thrombosis.

The operation as described by Carrel and Guthrie is essentially as follows. The vena cava and portal vein are isolated, their lumens closed above and below the site of anastomosis by ordinary serrafins, spring-jawed clamps or tape, and an incision made in each vessel, parallel with its longitudinal axis. Guthrie states that "the openings in the vessels should be in width about one-third the diameter of the vessel, and in length about one and one-half times the diameter of the vessel." But it is usually not necessary to actually cut away any of the vessel wall, the natural contraction of the circular fibres after the longitudinal incision allowing sufficient width. It is, however, essential that the openings in the corresponding veins should be the same size

FIG. 1.—Author's three-bladed, spring-jawed blood-vessel clamp, opened.

FIG. 2.—Showing curve of blades.

and shape, else considerable difficulty will be experienced in their proper approximation. The isolated portion of each vessel is thoroughly washed out with liquid vaseline. Two stay sutures are then placed, one at each end of the oval openings, so that the vessels are accurately approximated, the knot of the suture being outside in the angle formed by the two vessels. A third suture may be placed through the two posterior walls for traction, but should not be tied. One of the stay sutures then re-enters the vessel through its wall and a continuous over-hand suture joins the posterior edges. It is then passed through the vessel wall and tied with the second stay suture. The anterior wall is closed in a like manner. Very fine straight needles with ooo silk are used, and the stitches should be placed about one-half millimetre from the cut edge and about one-half to one millimetre apart.

The modifications in this technic which we adopted consisted only in the manner of procuring temporary hæmostasis and in the type of needle used. To do away with the time-consuming isolation of the vessels which consisted in freeing them for the entire length of the clamped-off portion, the clamping or tying of their tributaries and the application of the four serrafins, we used, after the first few operations, a pair of curved spring-jawed forceps designed by Dr. Sweet. These are practically diminutive intestinal clamps. It was found advisable to cover the blades with gauze or cotton cloth to prevent their slipping from the veins. These forceps are easily and quickly applied by simply raising the vessel with the fingers and clamping it lengthwise, the curve of the blades and their length giving ample room for the incision. Since difficulty was sometimes experienced in maintaining the parallel position of the two clamps I had a three-bladed clamp made which resembles the ordinary gastro-enterostomy clamp except in size. The application of this clamp is very simple. The portal and vena cava are lifted with the fingers and caught between their respective blades. We have found this clamp perfectly satisfactory in animal work.

The other modification of Carrel's technic was in the use of curved needles instead of straight. We had the Kirby No. 16 needles shortened by about half and curved. The sutures could thus be much more easily placed, especially near the ends of the opening.

The variation in the above technic necessitated by different pathological conditions consists only in the choice of vessels used. When the portal is thrombosed or otherwise diseased, or when adhesions prevent access to the upper vena cava, it will be found perfectly possible to make the anastomosis elsewhere. Normally, in the human a large mesenteric vein is found lying just above the common iliacs. If

the mesenteric vein is not of sufficient length to be easily approximated to the iliac the former may be ligated near the mesenteric base, divided, and turned downward. We have performed this modification on the dog and found it satisfactory. In the same way the mesenteric vein could be anastomosed to the lower vena cava. If an operator should fear to use the iliac, I think it would be possible to bring up the saphenous vein, as is sometimes done for drainage of ascites, and anastomose the mesenteric vein to it.

Conclusions.—From a rather extensive use of the Eck fistula in dogs we consider the operation safe, entirely compatible with a normal life, and simple of execution. We prefer the modification of Carrel's technic.

In cases of liver cirrhosis with ascites and in cases of thrombosis or other obstruction to the portal circulation, we consider the operation advisable, especially so where œsophageal varices exist. In the latter condition, at least, it should prove much superior to omentopexy.

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ONE HUNDRED AND TEN CONSECUTIVE CASES OF APPENDICITIS WITHOUT MORTALITY*

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The cases which are the subject of this report were operated at the Long Island College Hospital, with two exceptions, either by the author, his associate, Dr. James Watt, or by a member of the House Staff, in their presence and under their direction. Every form of the disease is represented in this group. We have adopted the usual classification, dividing the cases under the four heads, catarrhal, relapsing, suppurating and gangrenous appendicitis. Many of our cases are drawn from a poor neighborhood and were sent to us long after the indications were clear for operative interference. There are 16 cases of the catarrhal variety, 42 relapsing, 36 suppurating and 16 gangrenous. Nine patients were ten years old, or younger. One woman was sixty-eight years old and one man seventy-six. Appendicitis is most common with us at the time when epidemic influenza is rampant, and at the time of the so-called summer diarrhœas. The method adopted of treating these cases has been to operate in every case as soon as the diagnosis was made and the patient and operating room prepared. We have regarded the call to a case of appendicitis as taking precedence over any and all engagements whether of a social or professional character. Many of these cases have been operated late at night or in the small hours of the morning, not from choice but because the patients were first seen late by us. We have allowed no case to go over to the following day when any active symptoms were present, because we have learned that we are unable to determine to our satisfaction what is going to take place inside the belly and we feel that the patient will gain nothing by waiting. The preparation is very simple. The abdomen is shaved dry. A dose of scopolamine and morphine is given forty-five minutes before the time set for the operation. For the emergency cases no attempt is made to move the bowels, excepting one low enema. When vomiting is active the stomach is washed; the patient is anæsthetized on the operating table in a room provided for that purpose. We use either gas, oxygen and ether, or ethyl chloride and ether. As soon as the patient is unconscious, he is brought to the operating room and his skin pre-

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pared with iodine. We use the low McBurney incision in the large majority of cases, extending it as we find necessary. The mesentery of the appendix is found and ligated at once if possible. The appendix is isolated, crushed near its base and ligated with catgut. A purse-string suture of catgut is then passed around the base of the appendix in the cæcum. The appendix is removed either by cautery or scissors, cutting between the ligature and a clamp. The stump is turned in, the purse-string suture drawn tight and tied. The mesentery is tied over the stump wherever possible. In a small proportion of our cases, we are able to carry out this procedure without putting a finger inside the abdomen, or getting our gloves soiled with a drop of blood. We have many times removed the appendix from the base toward the tip when this procedure seemed indicated. The wound is closed in layers. We use clips for the skin.

When an abscess is found we isolate it with gauze pads, make a very gentle search for the appendix, and remove it in a large majority of cases. It was deemed wise not to remove the appendix in two cases of this series. Both cases made a good convalescence and neither has returned for further treatment.

In the gangrenous cases the appendix is always removed and an attempt is made to suture a piece of mesentery or fat over the cæcum.

When free pus is present with extensive peritonitis, it is sponged out whenever seen. One or two long straight retractors are then passed into the pelvis and the patient tilted to the right side. This procedure sometimes enables us to remove several ounces of pus, without passing sponges into the pelvis. This is all done rapidly and gently by the operator and no attempt is made to investigate further. One or more drains are placed in position and the wound partially closed. We never irrigate or put peroxide or ether, or any other chemical in the abdomen. Our drains are made of soft rubber tubing or iodoform gauze, covered with green gutta-percha tissue which is wrapped around the tube or gauze, projecting beyond the end. No rubber tubing or gauze is left in contact with the intestines. No one but the operator is allowed to put his hand or finger inside the abdomen. The assistants often end an operation with their gloves as clean as when they started. The cases with marked vomiting and all cases with free pus and extensive peritonitis have the stomach washed in the operating room as soon as the binder is put on. We have been fortunate in having no case of thrombosis in this series of cases. We have seldom recognized the Lane kink as a pathological condition. Most of our patients are placed in the Fowler position at once followed by hypodermoclysis when indi-

cated. The Murphy drip is used in a large proportion of cases. One dose of a quarter of a grain of morphine is given if pain is severe and may be repeated with a second dose of an eighth of a grain. We endeavor to give our patients a comfortable night following operation. Nothing is allowed by mouth, even water, for twenty-four hours in the severe cases, and nothing by mouth in any case for twelve hours. No morphine is allowed after drink or food is taken by mouth. We use the rectal tube as a routine measure, but find that it accomplishes very little. After thirty-six or forty-eight hours, the patients receive a low enema. If that is satisfactory, no further attention is paid to the bowels for twenty-four hours, when one dose of three grains of calomel and ten grains of bicarbonate of soda are given, followed in half an hour by Seidlitz powder. Our main standby in the bad cases is the stomach tube. At the first sign of regurgitation of bile or dilatation of the stomach or continued vomiting, or even hiccough, the stomach is washed out until the water turns clear. A large dose of calomel is given and gastric lavage repeated at the first indication of a return of the untoward symptoms. In one case this was carried out eight times in twenty-four hours.

We realize that we have been fortunate in having so large a series of cases recover, but we believe also that we have learned something from our past mistakes and from the successful experience of others. We believe that our results in these cases are due in part to the consistent plan illustrated by the following rules:

First, operate as soon as the diagnosis is made.

Second, make a sufficiently large incision. Use the greatest gentleness in handling tissues within the abdomen and stop operating as soon as the absolutely necessary work is done.

Third, use the Fowler position, Murphy drip and hypodermoclysis.

Fourth, use the stomach tube persistently and intelligently.

There has been considerable interest in medical economics of late. It may be worth while to state that 45 of these patients paid nothing for hospital care or professional services, 65 paid the hospital, and only 17 of the 110 paid anything for professional services.

ABSTRACT OF CASE HISTORIES

S. H., age nineteen, catarrhal, one previous attack.

L. S., age sixty-eight, suppurating, three distinct previous attacks. This patient had suffered from digestive troubles for many years, all of which are relieved.

R. P., age twenty-three, relapsing, one previous attack.

A. H., age thirty, relapsing, two previous attacks. The patient had a small ulcer on anterior wall of stomach which was turned in and sewed over. A year

later it was necessary to do a pylorectomy for a large indurated gastric ulcer occupying the site of the original lesion of the stomach.

F. D., age twenty-five, relapsing, one previous attack.

S., age thirty-one, suppurating, extensive peritonitis, two drains, one previous attack. There was an extensive peritonitis with a large amount of free pus. The appendix had ruptured at the base; fecal fistula developed which lasted thirty-one days.

A. S., age fourteen, gangrenous, one previous attack, no drainage.

R. S., age ten, gangrenous, three previous attacks, no drainage.

M. J., age twenty-three, suppurating, one previous attack. Patient had been sick in bed four days before coming to hospital.

R. G., age ten, suppurating, extensive peritonitis, two drains, no previous attacks. This boy fell on a picket fence, causing a penetrating wound in the perineum and a slight contusion on the lower right side of the abdomen. The day following the accident he was seized with typical symptoms of appendicitis and at operation a suppurating appendix with several ounces of free pus was found.

S. M., age twenty-six, suppurating, no previous attacks.

R. V., age fifteen, catarrhal, one previous attack.

B. C., age eight, suppurating, extensive peritonitis, two drains; a large retrocæcal appendix removed.

M. H., age thirty-two, relapsing, marked discomfort for six years, which prevented the patient from carrying on her vocation as a nurse.

F. W., age sixteen, gangrenous, no previous attacks. Patient had been vomiting pretty constantly for twelve hours before operation.

V. D. N., age twenty-two, relapsing.

N. B., age twenty-four, relapsing.

J. M., age twenty-eight, gangrenous, no drains. Many previous attacks.

H. L., age twelve, relapsing.

R. H., age twenty-five, gangrenous, one drain. All pain referred to region of gall-bladder which was found normal, but a large retrocæcal appendix was removed.

M. M., age twenty-four, gangrenous, two drains, rectrocæcal position, very free bleeding. Mikulicz drain.

L. B. D., age twenty-three, gangrenous, two previous attacks.

D. M., age thirty-four, gangrenous, extensive peritonitis. Mikulicz drain.

M. O. N., age twenty-one, gangrenous, peritonitis, two drains.

M. W., age thirty-four, relapsing, many previous attacks. A large Riedel's lobe. Patient made very slow convalescence.

G. D. R., age twenty-nine, gangrenous, peritonitis, two previous attacks. This patient was seized with his third attack while in his office. He recognized the condition, got a taxi, drove directly to the hospital, took a room and asked for the first available surgeon.

B. W., age forty, relapsing.

I. F., age thirty, catarrhal. This patient suffered from abdominal cramps and constipation commencing six months after the operation and growing gradually worse. About one year after her operation I saw her with her New York physician and found that she was suffering from acute intestinal obstruction. She was hurried around the corner to the New York Hospital where Dr. Gibson dis-

covered a band of adhesion around the ileocæcal valve with gangrene of the ileum necessitating extensive resection.

H. D., age twenty-five, gangrenous, one drain.

J. S., age thirty-nine, catarrhal.

A. S., age forty-four, relapsing, many attacks. An obliterating appendix which was attached in the true pelvis and which held the caput coli well down in the pelvis. The caput was club-shaped and very largely distended.

J. D., age eleven, relapsing, many previous attacks. Several large peritoneal glands found.

M. M., age forty-two, relapsing, history missing.

R. B., age thirty-four, suppurating, two drains, appendix ruptured near base.

C. S., age thirty-eight, gangrenous, free pus, fecal vomiting at time of operation.

W. Z., age twenty, suppurating, peritonitis, drainage.

A. B., age thirty, gangrenous, peritonitis. Mikulicz drain.

R. H., age thirty-eight, suppurating, abscess. Mucous membrane, only part of appendix left.

H. S., age twenty-six, suppurating, one previous attack, vomiting three days before operation.

V. J., age eighteen, catarrhal.

H. P., age thirteen, suppurating, abscess.

L. H., age thirty-six, relapsing.

B. G., age eighteen, catarrhal, retrocæcal.

C. L., age twenty-seven, relapsing.

F. M., age seventeen, suppurating, one drain, appendix removed piecemeal.

S. K., age twenty-three, relapsing.

M. C., age thirty-four, relapsing, two previous attacks, dermoid cyst of right ovary four by two inches in size and containing a considerable quantity of hair was removed.

Q., age fifty-six, suppurating, three previous attacks, one drain.

A. B., age twenty-eight, relapsing, three previous attacks.

N. H., age twenty-nine, suppurating, many previous attacks, free pus, two drains.

M. J., age fourteen, relapsing.

R. J., age eighteen, relapsing, two previous attacks.

W. B., age forty-two, suppurating, very extensive peritonitis, two drains. This patient was put on board a Ward Line steamer in Havana suffering from abdominal pain with vomiting. He was very sick during the entire trip, not leaving his bed and eating nothing. On arrival of the steamer in New York, he was put in an ambulance and brought to the hospital. When seen, his abdomen was enormously distended. Pulse about 160. Skin was cold and it looked as thought he would live but a few hours. He commenced to improve immediately after the operation and made a good, though tedious recovery. Six months later he returned to us from Ohio to have the hernia which had occurred at the point of drainage repaired.

D. P., age twenty-seven, suppurating, many previous attacks, one drain.

J. C., age ten, suppurating, one drain.

C. M., age thirty, suppurating, free pus, drainage.

F. McK., age thirty-one, relapsing.

E. C., age eighteen, relapsing, two previous attacks.

K. M., age twenty-seven, catarrhal.

T. M., age nineteen, relapsing.

V. B., age twenty-three, catarrhal, refused operation.

S. D., age thirty-six, relapsing, one previous attack.

J. N., age thirty-six, suppurating, three previous attacks, one drain, free pus.

A. R. F., age forty, relapsing, very many mild previous attacks. Almost continuous gastric distress for a period of sixteen months, which condition followed an acute illness which had been diagnosed as cholecystitis. The gall-bladder was found attached to the pylorus. It was otherwise normal. It was separated from the stomach and a piece of omentum placed between the two organs. The operation was followed by a complete recovery.

A. B., age sixteen, catarrhal.

G. E., age twenty-six, relapsing, three previous attacks.

F. M., age twenty-two, relapsing, appendix markedly congested and clubbed at the tip. Recovery from operation was rapid but patient was not relieved of her symptoms for several months.

M. C., age forty, suppurating, drainage. Patient also had a suppurating kidney which was removed later.

R. M., age nineteen, catarrhal, with cystic ovary.

M. O., age twenty-two, catarrhal.

H. G., age fifteen, suppurating, drainage, a large quantity of free pus.

C. C., age fourteen, catarrhal.

F. W., age twenty-three, relapsing, wound showed deep suppurating on eighth day. Tedious convalescence.

F. J., age sixteen, catarrhal.

C. A., age twenty-one, relapsing, appendix distended with pus.

J. O. L., age twenty-two, suppurating, extensive peritonitis, drain and free pus.

E. B., age twenty-eight, relapsing, two previous attacks.

K. M., age eight, suppurating, extensive peritonitis, two drains, considerable free pus.

F. B., age thirty, relapsing, peritonitis, no drains, three previous attacks. Colon imbedded in old adhesions, free bleeding. Mikulicz drain.

B. D., age seventeen, suppurating, peritonitis, one drain, free pus.

P. L., age ten, suppurating, peritonitis, one drain, free pus.

A. T., age eight, suppurating, peritonitis, one drain, free pus.

M. E., age ten, suppurating, peritonitis, one drain, free pus.

L. Y., age twenty-eight, suppurating, peritonitis, free pus, appendix not removed. Patient has been under observation for eight weeks and has had no recurrence of symptoms.

M. O., age thirty-five, gangrenous, localized peritonitis, one drain; appendix had ruptured at its junction with the colon, no fecal fistula.

A. M., age eight, suppurating, drainage.

J. D. W., age nine, relapsing, two previous attacks.

H. H., age nine, catarrhal.

S. McC., age forty, relapsing, appendix was large, clubbed at the end and contained a small quantity of pus. Patient has complained recently of pain on

the left side of the abdomen and of obstinate constipation. No diagnosis has been made of present condition.

W. D., age twenty-eight, suppurating, several previous attacks.

F. U., age twenty-four, suppurating, several previous attacks.

R. R., age twenty-five, relapsing, many previous mild effects.

A. S. S., age seventy-five, gangrenous, local peritonitis, no drain. Patient has suffered with symptoms of duodenal ulcer for twenty-five years. Made an excellent recovery. With one exception, a man of seventy-seven, this is the oldest patient I have operated for this disease. His attack was very acute and the gangrenous appendix was removed eighteen hours after his first symptom.

J. McG., age thirty, relapsing, the appendix was large, kinked and contained two large concretions, symptoms extend over three years.

N. S., age sixteen, catarrhal.

H. P. L., age nineteen, suppurating, extensive peritonitis, drainage, no previous attacks. This young man returned home from Princeton with a temperature of 103° and a pulse of 120, without realizing that he was particularly ill.

J. W., age thirty, suppurating, drainage, free pus, appendix not removed, wound healed. Patient has not reported recently, but had no symptoms after six weeks.

T. L., age nineteen, relapsing, three previous attacks and retrocæcal position of appendix.

S. D., age twenty-five, relapsing, two previous attacks, retrocæcal position.

A. M., age thirty-five, relapsing, almost constant pyloric spasm over a period of two years; symptoms relieved by alcohol.

C. A., age eight, catarrhal.

J. G., age twenty-six, gangrenous, no drains, two previous attacks.

B. D., age twenty-eight, relapsing, one previous attack. This patient was hurried in from her home on Long Island and operated on late at night on account of her serious symptoms. The appendix was enlarged and contained pus, but its condition did not correspond to the patient's symptoms. All symptoms, however, disappeared after operation.

C. H., age thirty, suppurating, three previous attacks, drainage, free pus.

M. K., age twenty-seven, relapsing.

B. D., age twenty-eight, relapsing, one previous attack.

R. D. M., age twenty-seven, suppurating, no drain. Patient eight months pregnant. Transferred to maternity ward; normal delivery at full term.

A. T., age seventeen, suppurating, extensive peritonitis, three drains, large quantity of free pus. This case is the most marked example of the fulminating form of the disease in this series of cases.

A. W., age twenty-eight, suppurating, drainage, local peritonitis, several previous attacks.

B. P., age twenty-six, relapsing. Patient six months pregnant, went through to term, normal labor.

RECENT TRAUMATIC DISLOCATIONS OF THE HIP*

WITH A REPORT OF TEN CASES AND THEIR END RESULTS

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During the 9 years from February, 1905, to February, 1914, at the Episcopal Hospital of Philadelphia, 10 cases of recent traumatic dislocation of the hip were admitted out of some 23,000 surgical cases, 6000 of which were classified as surgical injuries, making approximately 1 dislocated hip to every 600 surgical injuries. For the privilege of reporting the following cases I am indebted to Drs. Frazier, Davis, Deaver, Neilson and Mutschler, under whose services they were admitted.

Case I.—M. M., male, age twenty, admitted February 21, 1907 (file No. 619). The patient was admitted with a history of having had a large amount of coal fall upon him. On examination a high posterior dislocation of the left hip was found. The leg was adducted, inverted and flexed. Pain, tenderness and rigidity were noted about the hip. The patient was placed on a table face down, the knee and thigh were flexed and direct traction made downward while an assistant guided the head of the femur by pressure on the great trochanter, thus reducing the luxation (Stimson method). Five days later the patient was discharged in good condition.

Diagnosis.—High posterior luxation of the left hip. At the time this article was prepared no trace of the patient could be found.

Case II.—T. S., male, age fifty (?), admitted October 15, 1907 (file No. 2846). The patient had jumped from a third-story window and was brought to the hospital in an unconscious condition. There was a fracture of the skull and through the middle third of the left femur. The head of the right femur could be felt anterior just below Poupart's ligament. The luxation was easily reduced by circumduction. The next day the pulse became weak and irregular and Cheyne-Stokes respiration was present. The respiration and pulse gradually became weaker and he died on the eighteenth, three days after admission.

Diagnosis.—Fractured skull and left femur, and dislocation (pubic), anterior, of right hip.

Case III.—J. V., male, age forty-five, admitted June 28, 1909 (file No. 1610). He had been thrown from a crane, dislocating his right femur, the head being felt close to the sciatic notch. After reduction sand bags were placed on either side of the affected thigh. On the eleventh day he was up and about with no pain in the hip, so was discharged the next day.

* Read before the Philadelphia Academy of Surgery, April 6, 1914.

Diagnosis.—Posterior (sciatic) luxation of the right hip. No further history of the patient obtainable.

CASE IV.—J. M., male, age fifty-five, admitted April 19, 1910 (file No. 5094). The patient was admitted with a posterior dislocation of the right hip. The right thigh was flexed on the abdomen and adducted, while the knee was flexed and the foot turned in. He was unable to extend the thigh either by force or voluntarily, but could flex it on the abdomen. The great trochanter was felt anterior to its normal position and not prominent. The head of the femur could be felt in the sciatic area and could be felt to rotate with the thigh. Under ether anæsthesia the leg was flexed on the thigh and the thigh on the abdomen in adduction followed by outward circumduction and extension. The head of the femur was felt and heard to snap back into its normal position. Sand bags were placed on either side of the thigh. There was tenderness about the right hip for a week, otherwise he was in good condition. Four weeks later he was up and around, the hip being slightly painful, but he walked about on crutches. He was discharged on the forty-sixth day in good condition.

Diagnosis.—Posterior (sciatic) luxation of right hip. March 23, 1914, four years after the accident, he was working and found no disability from his dislocated hip.

CASE V.—B. S., female, age thirty-eight, admitted February 9, 1911, (file No. 473). One week previous to admission, while attempting to cross the railway tracks, the patient was struck by the tender of an engine, the engine and fire box passing over her, causing severe bruises, a fracture through the middle third of the right clavicle and a dislocated hip. The left foot was inverted and rested on the instep of the opposite foot and the head of the left femur could be palpated between the acetabulum and the crest of the ilium. The following day under gas and ether anæsthesia the luxation was reduced by the Allis method. Buck's extension with 10 pounds was applied. Three weeks later the left hip-joint was not particularly painful and showed no tendency of recurrence. The clavicle showed good union with slight deformity. She was discharged in care of the family physician.

Diagnosis.—Posterior (iliac) luxation of left hip.

In a letter from her physician January 24, 1914, three years after the accident, he says concerning her hip condition: "She has disability of the left leg due to the dislocated hip and fractured pelvis, and numbness and loss of power due to nerve injury from deep laceration of the thigh." It would seem her present condition is probably not due so much to the dislocation as to the nerve injury received at the time of the accident.

CASE VI.—H. K., male, age twenty-eight, admitted June 7, 1912 (file No. 1834). The patient fell from a 10-foot fence and was immediately brought to the hospital. The left leg was normal. The right leg was flexed and fixed in internal rotation, while the foot lay in inversion and the head of the femur could be felt on the flaring wing of the ilium. There was great pain when the leg was moved and some laxity of the iliotibial band. Under chloroform anæsthesia the luxation was reduced by flexion,

traction, external circumduction and extension. The right leg then measured ¼ inch longer than the left. The next day there was aching pain in the affected hip but he could invert the foot and evert the toes fairly well. On the ninth day the general motion of the hip was fairly free and he was allowed to be about on crutches. Discharged 3 days later, walking on crutches with no limitation of motion and no shortening of the right leg.

Diagnosis.—Posterior (iliac) luxation of right hip. X-ray No. 2527 showed reduction of dislocation. The last of March, 1914, he was reported to be in good health and had a good functional result in his right hip.

CASE VII.—B. L. S., male, age sixty-one, admitted January 23, 1913, (file No. 319). In jumping from a third-story window to the ground he caused dislocation of the right hip. The right thigh, well in the position of flexion and internal rotation, could not be brought into full extension. Measuring from the anterior superior spines to the internal malleoli gave 1¼ inches shortening of the right leg. The base of Bryant's triangle on the right was ½ inch shorter than the left. With the right thigh flexed the trochanter was felt 1½ inches above the Roser-Nelaton line. There was an area of tenderness on the level of the anterior superior spine and about 5 inches from it on the right. Reduction by the Stimson method (as in Case I) attempted for 11 minutes. The deformity was improved but the luxation not reduced. The following day the X-ray No. 5243 showed the hip still luxated. The patient being anæsthetized was placed in the supine position on a hard mattress on the floor, and the thigh flexed on the pelvis to a right angle and leg at right angles to the thigh. With traction upward, internal and external rotation of the thigh, together with pressure on the trochanter, the head of the femur was brought into position in the acetabulum. Buck's extension applied with light weights. Two weeks later the patient was in good general condition, and at the end of the third week the weights and straps were removed, making him much more comfortable. Starting at the end of the fourth week he was gradually allowed to remain out of bed for longer intervals and there was no notable deformity of the leg. On the forty-seventh day he was discharged in good condition as cured.

Diagnosis.—Posterior luxation of right hip.

In a letter from the patient just one year after the accident (January 22, 1914), he says: "I run, hunt, climb ladders, skate, and am able to work in the fields of my farm." This is sufficient evidence that he suffers no ill effects from the dislocation.

CASE VIII.—W. B., male, age twenty-six, admitted May 8, 1913 (file No. 1803). A cart load of coal was dumped, striking him in the middle of the thigh, covering him with coal, and he had to be lifted on to a stretcher. He complained of pain in the right hip-joint and inability to walk. Examination: The head of the right femur palpated posterior and high up above acetabular rim. The right leg was flexed, inverted and shortened. Ether anæsthesia given and the dislocation reduced by the Allis method. Discharged one week later as cured.

Diagnosis.—High (iliac) posterior dislocation of right femur.

He went to work in three weeks' time. March 21, 1914, ten and a half months after the accident, his hip was in good condition, having no pain at all, and he could go up and down stairs as well as before the accident.

CASE IX.—F. McL., male, age thirty-five, admitted December 8, 1913 (file No. 4974). While working on a roof a heavy gust of wind struck the man, causing him to fall 15 feet. He was brought to the hospital and on examination the left leg was found to be normal. The right leg was flexed, slightly abducted, and appeared lengthened, while the thigh was flexed and could not be straightened. The foot was not everted, probably due to the position of the pelvis. On movement there was severe pain and the head of the femur seemed to be dislocated, but the exact position could not be located, due to the rigidity of the adductors; a large area of ecchymosis was present on the posterior surface of the thigh and there was marked swelling. With the patient standing on the left leg the right was found to be in the position of abduction with the thigh flexed, knee flexed, and the toes resting on the floor in eversion (Fig. 1). X-ray No. 8722 showed an anterior luxation of the right hip. Plate No. 275a shows the hip after reduction. The patient was placed on a hard mattress on his back and ether given. An assistant held the pelvis by downward pressure on the anterior superior spines while the right leg was flexed to a right angle on the thigh and the thigh at right angles to the body. By strong traction upward, together with manipulation of the leg producing slight internal and external rotation of the thigh, and at the same time having pressure made on the great trochanter, the femur head was returned to its normal position with a snap that could be both heard and felt (Fig. 2). The patient was then put to bed with sand bags, one on either side of the affected limb. The following day there was still some pain in the hip but the leg was in good position. On the tenth day after reduction the sand bags were removed and the patient allowed to go about on crutches. Two days later he was discharged in good condition, walking on crutches.

Diagnosis.—Anterior (thyroid) dislocation of the right hip. When seen March 23, 1914, he had returned to work and his hip was as good as before.

CASE X.—J. G., male, age ten, admitted January 22, 1914, having been knocked down by an automobile. Being unable to walk he was brought to the hospital where a dislocation of the right hip posteriorly was found. The right leg was short, adducted and everted, the right foot resting on the heel of the left foot. There was limitation of motion of the right hip and the head of the femur was felt posterior to the acetabulum. Ether was given and the luxation reduced by flexion and traction, the head felt to slip into the acetabular cavity. Sand bags were placed on each side of the thigh. X-ray No. 9437 shows the head to be in its normal position after the reduction. On the sixteenth day the sand bags were removed and 2 weeks later he was discharged in good condition.

Diagnosis.—Posterior luxation of the right hip.

When seen March 23, 1914 (2 months after the accident) he was running about playing with the other boys and had no pain or disability.

FIG. 1.—Case IX. Showing anterior luxation of right hip.

FIG. 2.—Showing method of reduction (direct) in Case IX.

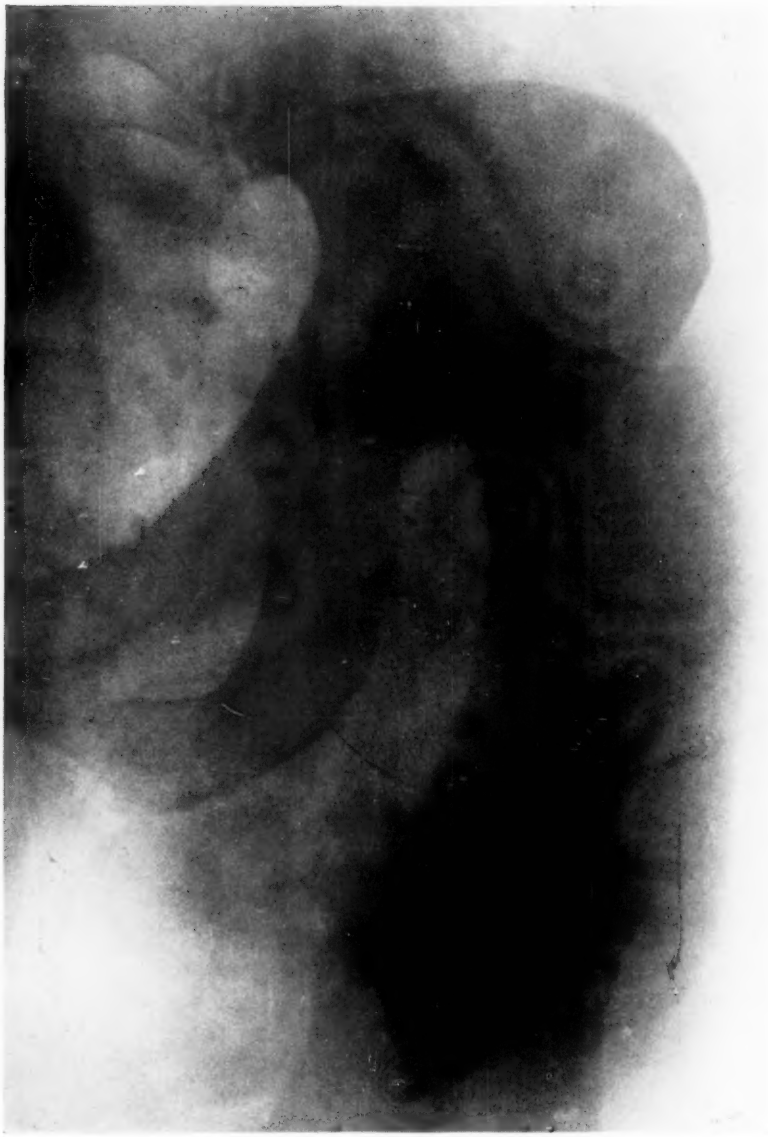

FIG. 3.—Case VII. X-ray No. 5243. Showing dislocation of right hip (posterior).

FIG. 4.—Case IX. X-ray No. 8722. Showing anterior dislocation of femur (right).

FIG. 5.—Case IX. X-ray No. 257*a*. Showing femoral head in position after reduction.

FIG. 6.—Case X. X-ray No. 9437. Showing femoral head in normal position after reduction.

In the above series of cases there are 9 males and 1 female; the age ranges from 10 to 61 years, and the time in the hospital varies from 3 to 47 days. As to the types of dislocation there were 2 cases of anterior, 1 each of the pubic and thyroid variety, and 8 posterior cases, 4 being iliac or high, 2 sciatic, while 2 are simply given as posterior. This series confirms the statistical records as to the greater frequency of the posterior type.

There were several methods of reduction used and each proved efficient, except in one case when the Stimson method was employed unsuccessfully for eleven minutes. In one case the method was not stated. The indirect method was used once, circumduction twice (although from the description it may have been the indirect with a wide circle of the knee), and the direct 6 times, one of which was accomplished in the Stimson position.

The mode of treatment following the reduction varied. Four cases were simply kept in bed, 2 had Buck's extension applied for a time following the reduction, and the remaining 4 were kept in bed with a sand bag on either side of the affected leg.

At the time this paper was prepared 8 of the cases could be traced; one died of a fractured skull while in the hospital; another was reported as having numbness and loss of power of the leg, due not only to dislocation of the hip but to fracture of the pelvis and nerve injury as well; the remaining 6 cases are reported as being in good health with no disability from the previously dislocated hip, the time since the accident varying from 2 months to 4 years. With such a record it is concluded that simple luxation of the hip when properly reduced should give no impairment of function.

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THE SIGNIFICANCE OF THE JACKSON VEIL *

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and

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At the 1912 meeting of the Western Surgical Association the discussion as to the true significance of the Jackson veil or pericolic membrane showed that the question was far from being solved. A committee composed of Drs. D. N. Eisendrath, J. Rilus Eastman and Howard N. Hill was appointed to furnish the Fellows of the Association with blanks in order to note their findings at operation and to report the same at the 1913 meeting.

The principal phases of the present symposium should be, according to my conception of the question, (*a*) whether the membrane or veil described by Jackson in his first paper[1] is always a pathological structure; (*b*) whether it is always a normal structure; or, finally, (*c*) whether it is a normal, *i.e.*, a developmental, membrane, which may undergo pathological changes and give rise to conditions which cause clinical symptoms.

The committee asked each Fellow to report his observations in as concise a manner as possible; and, as chairman of the committee, I shall open the subject for discussion by a report of my observations (*a*) in the living, during operation; (*b*) in the human cadaver; and (*c*) in the human fœtus. We have noted our findings in 25 cases operated on during the last four months at the Michael Reese Hospital. All of these were subjected to operation on account of symptoms of acute or chronic appendicitis, with the exception of Case 25, which will be described separately in Group 4.

A. CLINICAL OBSERVATIONS

As a matter of convenience one can divide the observations made during operations into four groups as follows:

1. The membrane corresponds in every detail to the normal parieto-

* This article is the report of the Chairman of the committee and was read before the Western Surgical Association at St. Louis, December, 1913.

[1] Surgery, Gynecology and Obstetrics, September, 1908.

colic fold of the fœtus or adult cadaver, even though there is ptosis of the cæcum.

2. The membrane is thicker and less vascular than in Group 1, and may cover a portion of the cæcum and appendix.

3. The pericolic membrane (parietocolic fold) fuses at its lower border with the fold of Treves, or the two membranes (parietocolic and Treves) are present separately.

4. The parietocolic fold has undergone pathological changes with resultant kinking or the production of a double-barrelled shot-gun deformity of the ascending colon (Fig. 23).

Group 1 (See Fig. 1).—These cases (15 in number) all showed

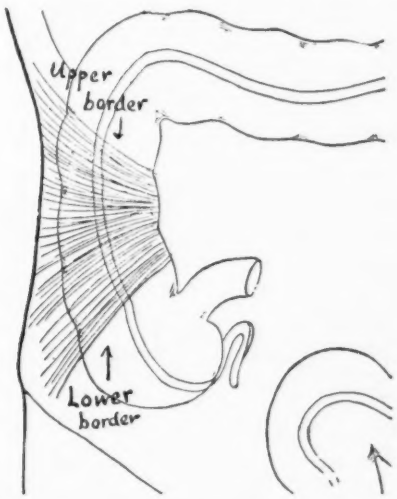

FIG. 1.—Sarah M., aged eighteen. Chronic appendicitis. Upper border at hepatic flexure, lower border one inch above end of cæcum. Not very vascular membrane extending across colon (ascending) to fuse with mesocolon on inner (mesial) side.

a fine, veil-like, translucent membrane, which was reflected from the parietal peritoneum, and then passed across the front of the ascending colon, ending gradually at the anterior longitudinal band in some cases, while in others it extended across the entire front of the ascending colon, either fusing with the peritoneum of the mesocolon or with the omentum near the hepatic flexure. The upper and lower borders could be readily picked up, the upper being at the level of the hepatic flexure and the lower from 1 to 1½ inches above the termination of the cæcum. In one case, the cæcum and ascending colon were so mobile that the cæcum and appendix (Fig. 2) were found quite loose on the right side of the true pelvis, between the bladder and the lateral pelvic wall.

Even in this case the membrane, although much longer than when the cæcum was in the right iliac fossa, showed the same upper and lower borders and other characteristics of the pericolic membrane. Age seems to make no difference in the distribution and other features, except that the membrane seems a little more vascular in early life. The ages in this first group varied from 12 to 28 years. In none of these cases had any angulation of the cæcum or ascending colon oc-

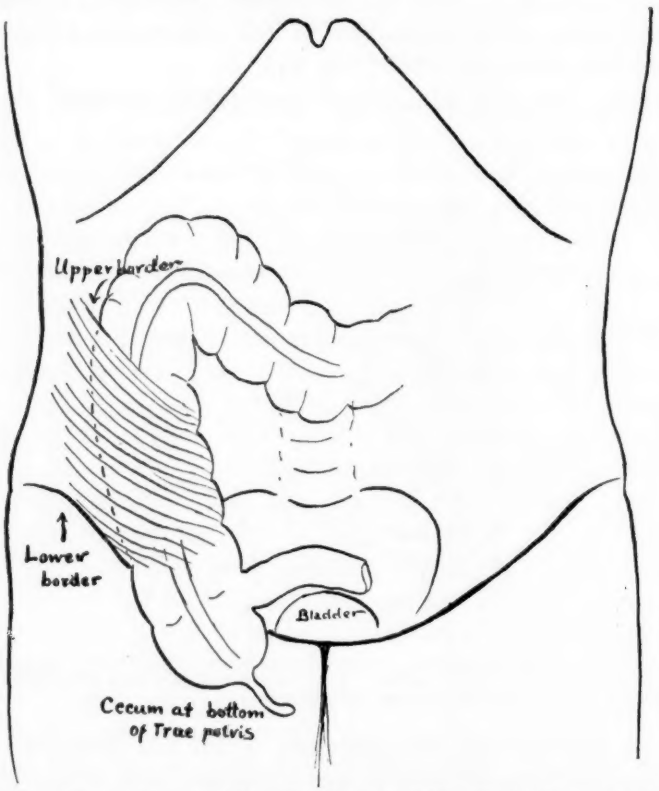

FIG. 2.—Jane Y., aged twenty-eight. Chronic appendicitis. Ptosis of cæcum and ascending colon into true pelvis. Cæcum and appendix lying at bottom of true pelvis. Typical pericolic fold with upper border at hepatic flexure and lower just above cæcum.

curred. The condition of the appendix amply explained the clinical symptoms. The mobility of the cæcum exerted no influence upon any of the characters of the membrane. In none of these cases was the membrane disturbed. In some the membrane showed many fibrous strands, and deposits of fat. Drs. L. A. Greensfelder and D. N. Eisendrath have found the membrane with the above upper and lower limits in over forty children, ranging in age from 2 to 12 years, who were

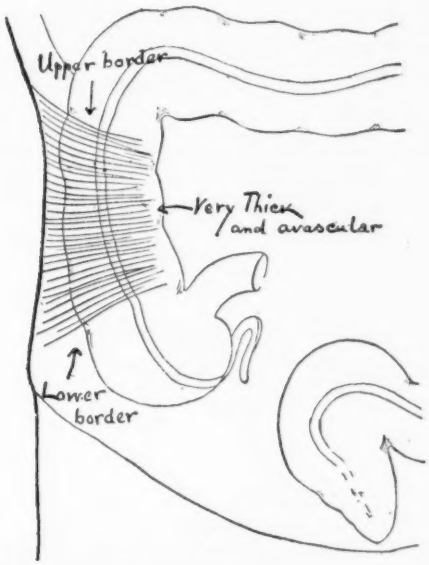

FIG. 3.—Herman E., aged fifty-seven. Tuberculous peritonitis, evidently primary of appendix or cæcum. Pericolic fold had typical upper and lower limits but was avascular, one inch in thickness, and studded with miliary tubercles. Upper border at hepatic flexure and lower border 1½ inches above end of cæcum.

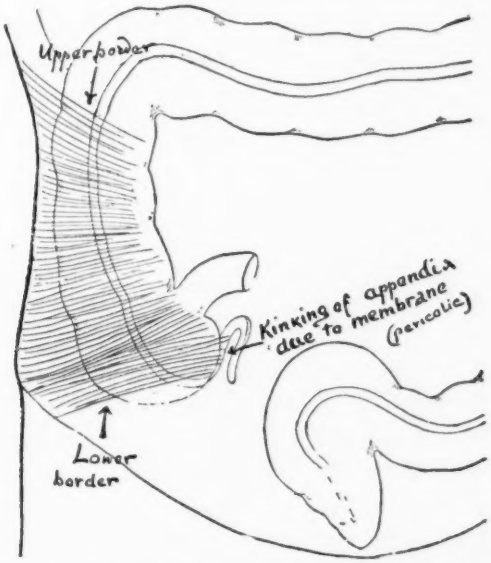

FIG. 4.—Esther B., aged eighteen. Acute appendicitis. Upper border of pericolic fold at hepatic flexure. Appendix folded upon itself close to cæcum by extension of pericolic fold downward over proximal third of appendix, causing kinking of appendix, which was greatly enlarged and inflamed distal to the kink.

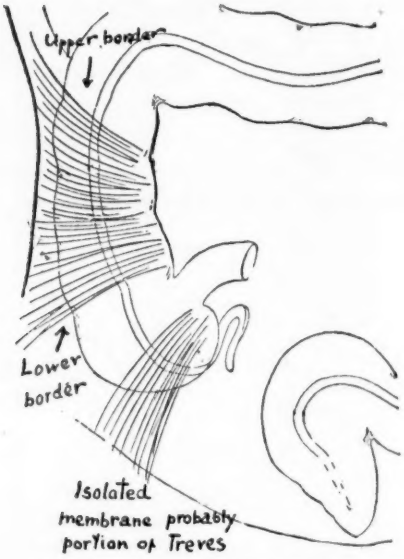

FIG. 5.—Jennie M., aged twenty. Chronic appendicitis. Cæcum very movable. Pericolic fold, upper border at hepatic flexure, lower border 1½ inches above end of cæcum, extends entirely across ascending colon. A fine membrane (probably part of a fold of Treves) covered cæcum at its lower end.

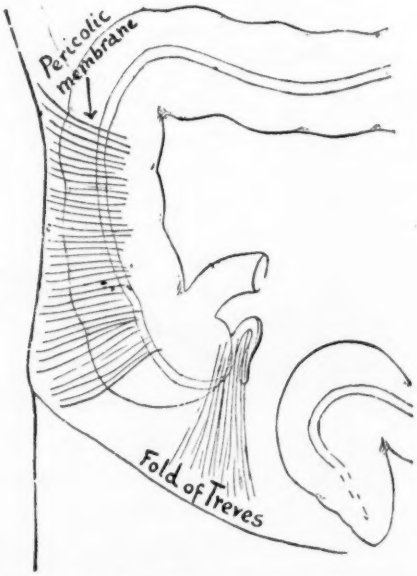

FIG. 6.—Harvey S., aged twenty-five. Chronic appendicitis. Upper limit of pericolic fold at hepatic flexure. Membrane extremely vascular and thick in places, fibres directed downward and inward, and extends across ascending colon to anterior longitudinal band or slightly beyond it. Separated one-half inch at lower end from fold of Treves, which is well marked and forms several pockets.

operated upon for appendicitis at the Sarah Morris Children's Hospital.

Group 2.—In two cases (Fig. 3), one operated on for a general peritonitis due to a perforated appendix, and the other a case of tuberculous peritonitis, the membrane was very thick and fibrous. But even in these cases there was no constriction or angulation of the colon or cæcum; and the upper and lower borders were the same as those in the first group. These two cases are of interest in showing that under certain conditions the pericolic membrane may only resemble the

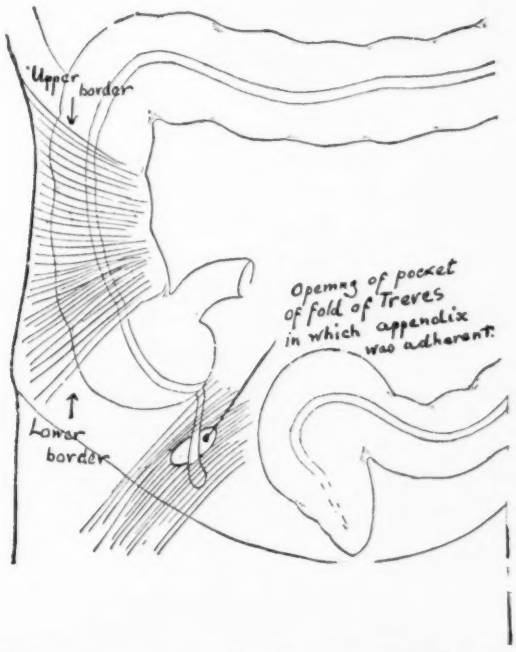

FIG. 7.—Sam C., aged twenty-eight. Chronic appendicitis. Well marked pericolic fold extending down and inward from hepatic flexure at its upper border to just above cæcum and across to anterior longitudinal band. Appendix lies in pocket formed by fold of Treves.

normal structure in its anatomical distribution, but be many times thicker and quite opaque. One can readily see how such a membrane can undergo either circumscribed or diffuse cicatricial changes with subsequent kinking and other forms of obstruction in the caliber of the colon.

In two other cases of this second group, the upper border of the parietocolic fold was the same as in the first or " normal " group, but at its lower end it covered a portion of or the entire cæcum. In one case (Fig. 4) the membrane caused a distinct kinking of the appendix

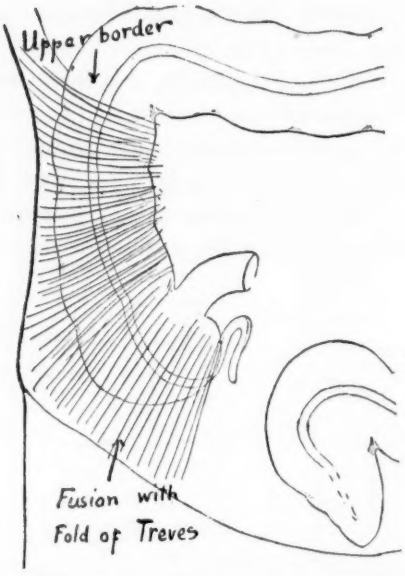

FIG. 8.—Pearl M., aged twenty-five. Pericolic fold—upper border indistinct, becoming thinner and more veil-like toward cæcum where it blends with fold of Treves which covers end of cæcum and appendix. Pericolic fold quite vascular and contains much fat.

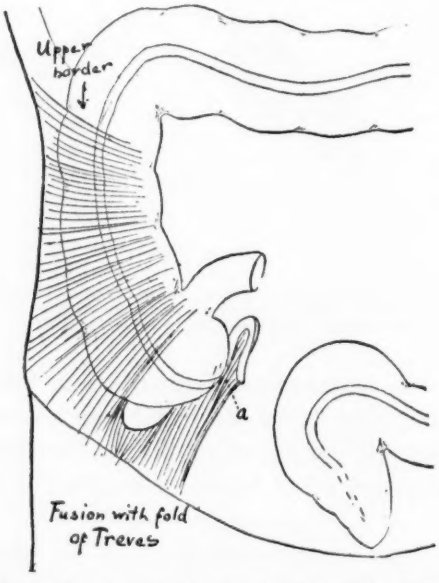

FIG. 9.—Benjamin E., aged twelve. Acute catarrhal appendicitis. Cæcum slightly movable. Distinct pericolic veil or membrane continuous with parietal peritoneum on outer side and extending inward to mesocolon on inner side of ascending colon. Membrane fuses below with fold of Treves, covering entire cæcum and ascending colon. Fold of Treves becomes continuous with meso-appendix at *a*.

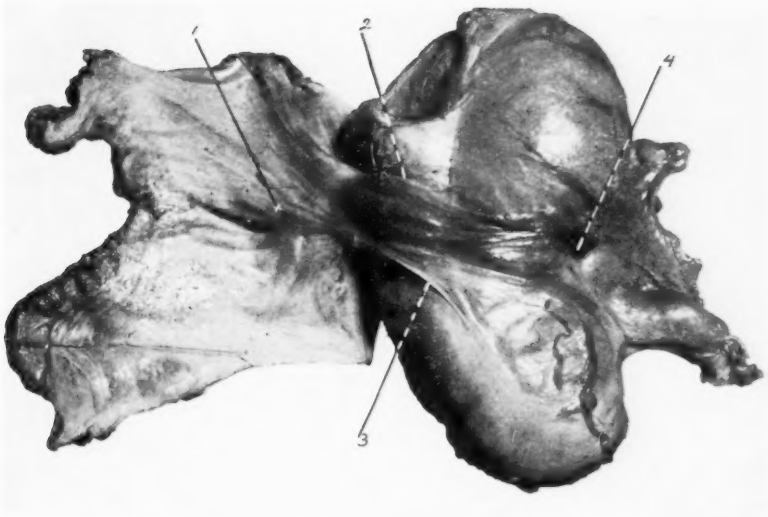

FIG. 10.—Photograph (not retouched) of ileocolic region of female adult cadaver—died of cancer of stomach, without metastases. 1, reflection on parietal peritoneum of fold of Jonnesco (Jackson veil or pericolic membrane); 2, upper limit of fold or membrane; 3, lower limit of fold or membrane; 4, inner limit of fold or membrane (fuses with mesentery on inner side of ascending colon).

FIG. 11.—Wash drawing of specimen taken from cadaver of adult. Cause of death, stab wound of lung. *UB*, upper border of parietocolic fold; *LB*, lower border of parietocolic fold; *O*, fusion of upper border of parietocolic fold with omentum.

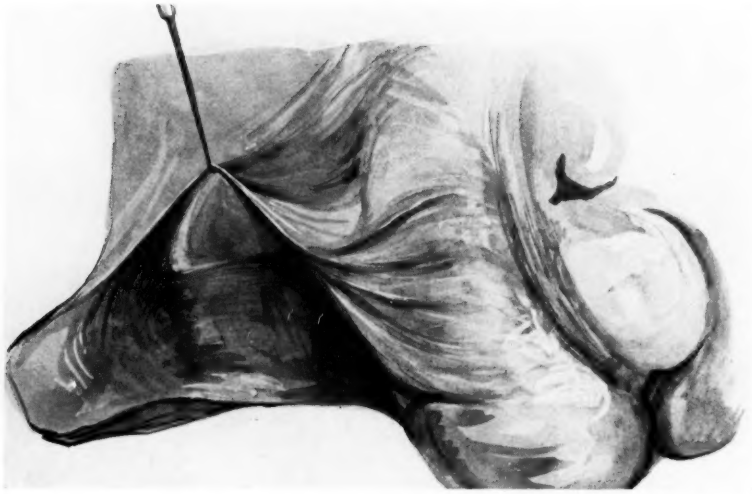

FIG. 12.—Lower end of parietocolic membrane shown in Fig. 11—lifted up to show reflection from abdominal wall.

FIG. 13.—Parietocolic membrane causing double-barrelled shot-gun deformity of ascending colon.

FIG. 14.—Left-sided fetal parietocolic membrane. *U*, upper and, *L*, lower borders.

with resultant dilatation of the lumen and other changes distal to the kink.

Group 3.—There were 6 cases in this group, all operated on account of symptoms of acute or chronic appendicitis. In the first three cases (Figs. 5, 6 and 7) the parietocolic fold (pericolic membrane, or Jackson veil) and the bloodless fold of Treves were so well developed that one could distinctly note where the pericolic membrane (parietocolic fold, Jackson veil, or fold of Jonnesco) ended and the fold of Treves began, the two being separated by a free space varying greatly in

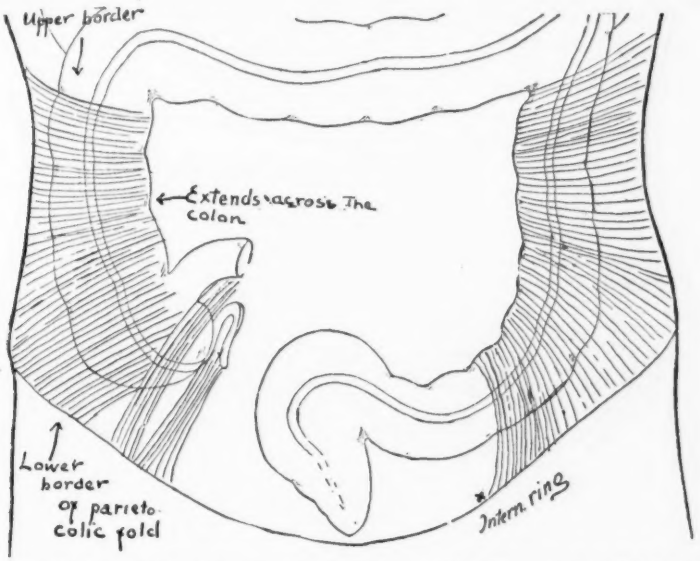

FIG. 15.—Fusion of folds of Jonnesco (parietocolic), fold of Treves and of Reid (genitomesenteric) on right side and fusion of left parietocolic fold and genitomesenteric fold of Reid on left side (from six months' fœtus).

width. The parietocolic fold had all of the characteristics of the cases regarded as "normal" and placed in Group 1. The bloodless fold of Treves covered the lowermost end of the cæcum or this and the appendix. In the case shown in Fig. 7 the appendix was quite firmly ensconced in a shirtwaist pocket-like niche formed by the fold of Treves. Before Eastman [2] called our attention to this action of the fold of Treves, I had regarded such appendices as lying in a pocket of adhesions. In the cases shown in Figs. 8 and 9 the lower border of the parietocolic fold could be seen to fuse imperceptibly with the bloodless fold of Treves, the two covering the cæcum or appendix, or both.

[2] Surgery, Gynecology and Obstetrics, April, 1913.

The fold of Treves in one of these cases fused distinctly with the mesentery of the appendix. As in Groups 1 and 2, one could not find any evidences of a kink or other interference with the lumen of the colon or cæcum.

Group 4.—In this case the patient was operated on for chronic appendicitis in 1908, a note at that time being made that "the ascending colon showed a well-marked Jackson veil." She returned three years later with symptoms of interference with the movements of the colon, so well described by Jackson in both of his papers. A second operation showed that, as a result of a cicatricial contraction of

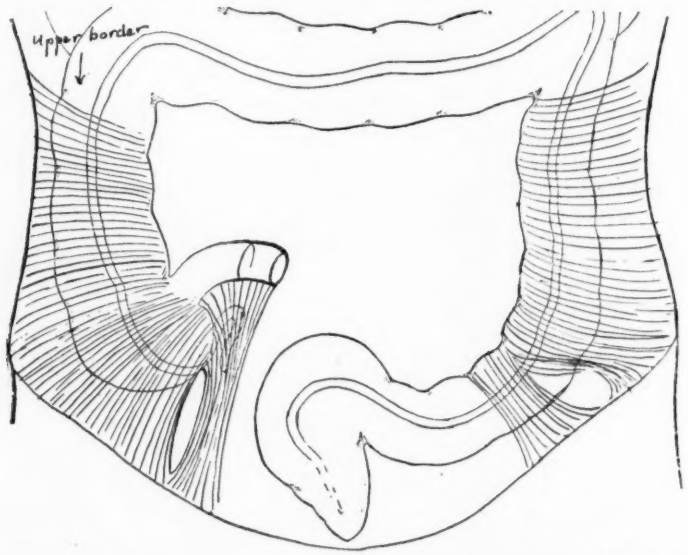

FIG. 16.—Fusion of parietocolic fold, fold of Treves, and genitomesenteric fold of Reid on right side and fusion of parietocolic fold on left side with genitomesenteric fold of Reid. This latter fusion is the rule in female fœtus.

a portion of the veil formerly covering the ascending colon, a "double-barrelled shot-gun" deformity had resulted. The cæcum was greatly dilated on the proximal side of the contracted area (Fig. 13). An anastomosis of the transverse colon and cæcum was done. I shall refer later to the significance of this personal clinical experience as showing that in some cases the veil may undergo pathologic changes, and cause kinking and other forms of acute and chronic intestinal obstruction.

B. CADAVER OBSERVATIONS

In several recent autopsies the pericolic membrane was studied within a few hours after death, and the results are shown in Figs. 10, 11 and 12.

The objection may be raised that not a sufficient number of subjects have been dissected. There is no doubt in my mind but that this method would be a most fertile field for a future investigation, but my own few findings corroborated those observed during operations in such a manner that I thought them to be of sufficient value to add as confirmatory evidence.

In Fig. 10 is shown the abdominal wall adjacent to the cæcum and ascending colon removed intact and photographed, without retouching the photograph. The specimen shows distinctly a reflection of a fold from the parietal peritoneum to the ascending colon, quite independent

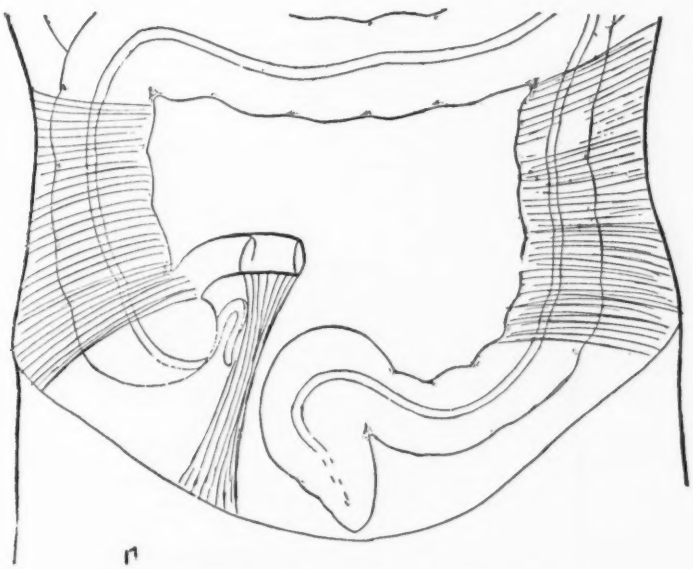

FIG. 17.—Well marked left and right parietocolic fold.

of the peritoneum lining the abdominal wall on the outer side of the ascending colon. The upper border of this parietocolic fold (fold of Jonnesco, pericolic membrane, or Jackson veil) is at the level of the upper third of the ascending colon, and the lower border about one and a half inches above the end of the cæcum. There is a distinct pocket between this membrane or fold and the peritoneum of the lateral abdominal wall. The membrane contains quite a little fat, and extends across the colon to fuse with the mesocolon on the inner side of the ascending colon. Its fibres are directed downward and inward. The ileocolic region, illustrated in Figs. 11 and 12, was not adapted for a

photograph, but was most conscientiously drawn from the fresh specimen to show the pericolic membrane. The membrane was much thinner than in the specimen shown in Fig. 10, and contained a number of fine vessels.

Its distribution as well as its upper and lower borders corresponded accurately to the description given by Hall of Jackson's first case. It extended from the hepatic flexure to a point about one and a half inches above the cæcum, and fused on the inner side of the upper part of the ascending colon with the right end of the omentum (Fig. 11, *O*).

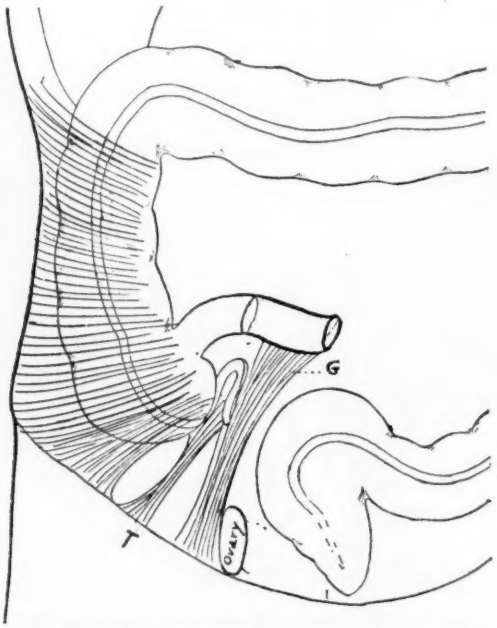

FIG. 18.—Fusion of fold of Treves and parietocolic fold.

In Fig. 12 the artist has attempted to show how the membrane can be lifted from the parietal peritoneum of the posterior abdominal wall.

In one of these cadavers the cause of death was a carcinoma of the stomach without peritoneal metastases. In the other, the cause of death was a stab wound of the lung. Both specimens show different stages of the pericolic membrane. In one (Fig. 10) it is firm, but not fibrous, and contains much fat. In the other it is extremely thin and translucent. In both, the ascending colon and cæcum were normal in caliber and appearance.

C. EXAMINATION OF FŒTUS

We have examined and made notes of our findings in 10 cases (see Figs. 14–20, inclusive). The ages varied from 6 months to full term. The results were far more uniform than those reported by Dr. Eastman, who found the parietocolic fold in 5 of 28 fœtuses. We have found it in nearly every dissection of cases where the rotation of the cæcum was complete. It had the same limits as in post-uterine life, but the membrane itself was extremely thin and contained a number of fine capillaries, which were directed downward and inward. In some of the dissections there was a fusion of the parietocolic fold on the right

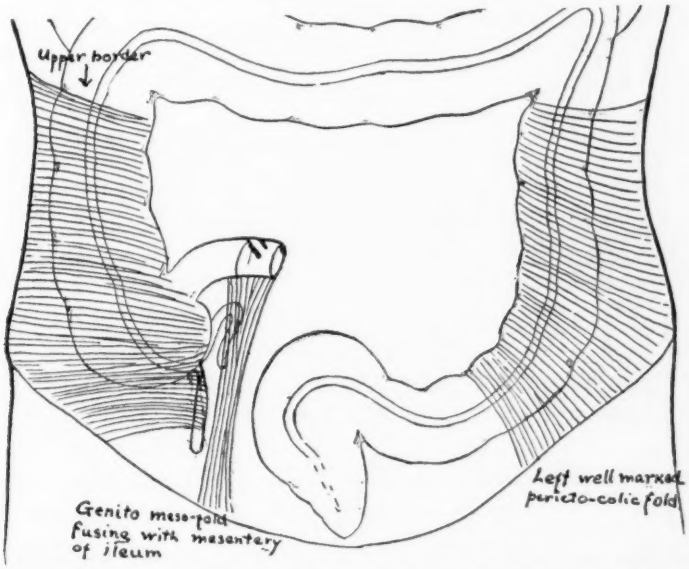

FIG. 19.—Poorly developed parietocolic fold on right side with undeveloped fold of Treves. The genitomesenteric fold on right side fused with mesentery of ileum. Well marked left-sided parietocolic fold with upper border at splenic flexure and lower border at junction of sigmoid and descending colon.

side with the fold of Treves and the genitomesenteric fold of Reid. The latter was quite constant on both sides, especially in female cadavers. In several specimens the parietocolic fold fused with the fold of Treves at only one point, the remainder showing a pocket-like gap, in which the appendix lay. One fœtus showed imperfect cæcal rotation, with an absence of both the parietocolic fold and the bloodless fold of Treves. The genitomesenteric fold was well developed, however.

Fig. 20 was sketched from a fœtus where a localized thickening of the right parietocolic fold caused a distinct kink of the ascending colon.

The suggestion offered by Eastman that a thickened and cicatricial genitomesenteric fold corresponds to the ileopelvic band of Lane, causing kinking of the ileum, seems to us a very plausible one.

One of the most interesting facts which our examination of fetal cadavers revealed was the constant presence of a parietocolic fold on the left side, corresponding in every particular to the same structure on the right side. Fig. 13 shows such a membrane drawn from a full-term fœtus. In some of the specimens (six in number) the upper border was at the level of the splenic flexure, and fused imperceptibly with the left end of the omentum. The lower border of this left pericolic membrane was at the junction of the descending colon and

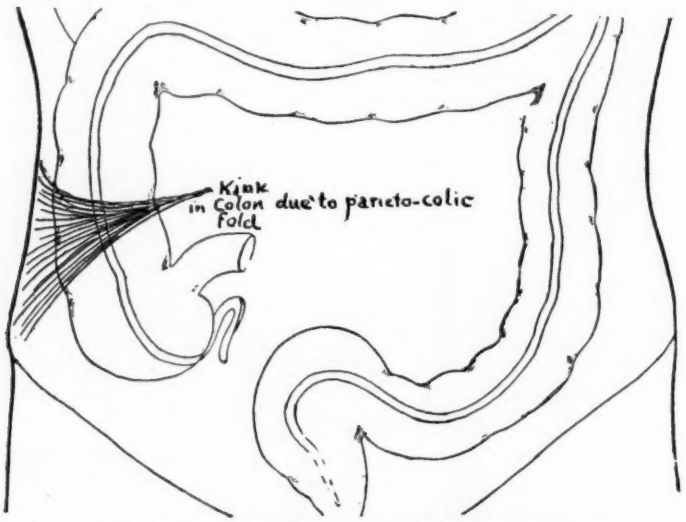

FIG. 20.—Parietocolic fold producing a distinct kink in ascending colon.

sigmoid (Fig. 19). In several specimens there was a fusion of the left parietocolic fold with the genitomesenteric fold of Reid. The point of reflection of the left pericolic membrane from the parietal peritoneum was the same as on the right side; and it passes across the descending colon to unite with the mesocolon. Dr. John E. Summers had called my attention to similar observations made by Gray and Anderson in 1912 and published in the form of a monograph.

SUMMARY

From our observations during operation, from dissection of cadavers, and, finally, from examination of 10 fœtuses, we believe that certain conclusions can be drawn.

The parietocolic fold of Jonnesco, synonymous with the pericolic membrane or Jackson veil, is a reduplication or fold of peritoneum, which is constantly found during fetal and postnatal life. This membrane corresponds in every way to the description given by Hall of Jackson's specimens in his two principal papers, published in 1908 and 1913, respectively. It is a fine translucent membrane, which varies greatly in vascularity. In some of our cases there were only a few fine capillaries, while in others the membrane was extremely vascular. The upper border of this right-sided pericolic membrane is almost invariably at the level of the hepatic flexure; and its lower border from one to one and one-half inches above the lower end of the cæcum. In some of our cases the lower border either extended a little further down and covered the entire cæcum and a portion of the appendix, or fused with the fold of Treves. In the great majority of cases this fusion did not occur. The vessels of the pericolic membrane are, as a rule, directed downward and inward. In two of our cases (see Group 2) the membrane was as thick as ordinary card-board, and showed practically no vessels. In the remainder of the patients the membrane was very thin. It extends inward across the front of colon to the attachment of the mesocolon, and either fuses with the peritoneum covering the latter or fuses with the omentum along the upper third of ascending colon. These may be called normal cases, the membrane being a persistence of a fetal structure, and under no circumstances should it be stripped off. Such a step would result in leaving an extensive denuded surface.

From the examination of our specimens and from observation in the living, we believe that the genitomesenteric fold of Reid is the forerunner of the ileopelvic band of Lane, and bears the same potential relation to the Lane kink that the pericolic membrane bears to possible kinks of the ascending colon. That such constrictions occur one can no longer doubt. The case reported in Group 4 affords ample proof of the rôle which the Jackson veil may play in the production of acute and chronic obstruction of the ascending colon and cæcum. We are not prepared to state at the present time what causes this change in the pericolic membrane from an innocent persistent fetal structure to the production of a distinct pathological entity. In our opinion Jackson, Pilcher, Gerster, Flint, and others have rendered a great service in calling attention to the various sequelæ of such pathological changes in the pericolic membrane.

One of the chief objects of this investigation, we believe, has been fulfilled by calling attention to the fact that there are two distinct

types of pericolic membrane: (1) those which are innocent, and (2) those which may cause mechanical interference with the function of the colon. Each case must be judged upon the operative findings; and one is not justified in saying that every pericolic membrane requires interference. The majority are perfectly normal structures.

Our examinations of fetal cadavers confirm those of Gray and Anderson, that there is a left parietocolic fold, which corresponds in every detail to the same structure on the right side. It is a constant finding in the fœtus; and no doubt search for it in the future during operations on the left side of the abdomen will confirm these fetal observations.

The treatment of the pathological conditions due to the right pericolic membrane must depend on the findings in the individual case.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY

Stated Meeting, held at the New York Academy of Medicine, April 8, 1914

The President, Dr. Frederic Kammerer, in the Chair

ILEOSIGMOIDOSTOMY: APPENDECTOMY: VISCEROPTOSIS WITH ADHESIONS

Dr. Parker Syms presented a woman, twenty-nine years old, who was admitted to the Lebanon Hospital on January 11, 1914. Her family history was negative. The patient gave a history of a curettage three years ago, and stated that during the past seven years she had had repeated attacks of pain in the right iliac fossa; these attacks were of a few days' duration and were accompanied by vomiting.

Present history: About three weeks before her admission the patient had an attack of influenza, which lasted one week. A week later, while still in bed, she was seized with pains over the abdomen, with fever. She vomited three times; her bowels were constipated.

At the time of her admission, the patient showed evidences of acute intestinal obstruction. There was marked distention of the abdomen, and she felt nauseated. The pulse and temperature were normal, as was also the blood count. An examination of the urine was negative. The bowels were relieved by repeated enemata. The clinical picture was that of an acute mechanical obstruction of the bowels.

Operation: Upon opening the abdomen through a free rectus incision, the appendix was found to be in a condition of chronic inflammation, and bound down by a contracted mesentery. The colon was much displaced and distorted, and the abdomen was filled with adhesions. As the patient's condition was unsatisfactory, Dr. Syms decided not to prolong the operation by separating adhesions, straightening out kinks, etc., and proceeded at once to transplant the lower end of the ileum into the sigmoid, doing a lateral anastomosis, with clamps.

The patient made a satisfactory recovery from this operation, and began to improve in every way. She had gained considerably in weight and now enjoyed excellent health, whereas prior to the operation she had been a hopeless neurasthenic. She was entirely free from bowel

disturbance, and was able to attend to her household duties with comfort. While the final outcome of the case was still in doubt, the present outlook was very encouraging.

Dr. Robert T. Morris said that in the case reported by Dr. Syms the operative procedure might perhaps have been simplified somewhat by lifting up the ileum and, without stopping to break the adhesions, placing it against the visible part of the sigmoid and doing an anastomosis, making the incision at least two and a half inches long. By this method, the speaker thought, there was less danger of reversed peristaltic action by which the contents of the gut would be carried back into the colon. In one case where he short-circuited the bowel, the patient, a chronic asthmatic, was not only relieved of her intestinal symptoms, but had also remained free from her former violent attacks of asthma.

PERINEAL PROSTATECTOMY BY A SPECIAL METHOD

Dr. Syms presented a man, sixty-seven years old, who was admitted to the Lebanon Hospital December 14, 1913, with symptoms typical of prostatic obstruction. These dated back four or five years, when he began to have frequency, voiding urine every hour. About a year and a half ago he began to suffer from pain in the lumbar region, with increased frequency. Ten days before his admission to the hospital he developed complete retention of urine, and since then he had to be catheterized. Otherwise, physically, he was in good condition, and his urine was normal, excepting for the presence of pus and bacteria in a moderately heavy sediment.

Dr. Syms said his reason for showing this patient was to illustrate a method of prostatectomy which he proposed in a paper read before this Society in November, 1898. The method consisted in making a small, suprapubic incision which extended down to, but did not enter, the bladder. The patient was then placed in the lithotomy position and a median perineal incision was made, exposing the prostate. The sheath was opened and the prostate enucleated through the perineum. Through the suprapubic incision the operator or his assistant could exert pressure, pushing the prostate downward. This rendered enucleation easy, and made it possible to reach the prostate without the aid of tractors of any kind. Using the fingers of the two hands, one above and one below, the operator could enucleate the prostate with great precision and facility. The bladder not being opened above or below, this operation had all the advantages of the perineal method, and was devoid of the great disadvantages of the suprapubic method.

In this particular case the patient made a rapid and satisfactory recovery, and now had perfect bladder function; that is, he was able to empty his bladder and had entire control over it. Recently, Dr. W. H. Stewart took a radiograph of his bladder while distended with a solution of collargol, and the picture showed that the internal sphincter had been perfectly preserved. At the present time there was slight irritability of the bladder, which would doubtless soon disappear.

DOUBLE PERINEPHRITIS WITH SEVERE RENAL COLIC AND LEFT HYDRONEPHROSIS

Dr. Syms presented a man, twenty-three years old, who was admitted to the Lebanon Hospital on December 12, 1913, with the history of scarlet fever in childhood and removal of the appendix six months ago. He was moderately addicted to the use of alcohol and tobacco; denied a venereal history.

Present history: Two years before admission, he was seized with intense pain in the left lumbar region, radiating downward anteriorly into the penis and accompanied by chills and vomiting. This attack lasted about two days. During the attack he was able to pass urine in small quantities, and he had never noticed any blood. A year ago he had a second, similar attack on the right side, lasting about 48 hours. Two days before admission he had another attack similar to the first.

Physical examination was negative, with the exception of tenderness over the left kidney region. Cystoscopic examination and ureteral catheterization by Dr. Abraham Hyman showed some congestion of the bladder, especially in the region of the trigone. The right ureteral orifice appeared normal; the left was somewhat œdematous. A catheter was introduced into the right ureter without obstruction, and some bloody urine obtained. Dr. Hyman thought the blood might be due to traumatism. On the left side, as soon as the catheter entered the pelvis, there was a profuse flow of dark, turbid urine, containing blood clots, showing that there was an obstruction in the ureter, with consequent hydronephrosis. An injection of indigo carmine was secreted by the right kidney in twenty minutes, and by the left kidney in eleven minutes. Examination of the urine from each kidney separately showed the presence of red blood-cells, albumin, with granular and hyaline casts. An X-ray did not show the presence of stone.

The conditions in this case, Dr. Syms said, were unique in his experience. For two years or longer this patient had suffered at various times from severe attacks of renal colic. He had visited several hospitals in this city, where he had been examined for stone, and none being

found, he had not been subjected to operation. In the intervals between the attacks the patient had not been entirely well, suffering more or less pain. When he came to the Lebanon Hospital, he was suffering agonies from a severe attack of left renal colic. When the cystoscopic examination was made, and the left kidney was emptied, he experienced immediate relief, but a few hours later he had a severe attack of renal colic on the right side which persisted up to the time of his operation. The operation consisted in decapsulation of both kidneys. The left ureter (the side of the hydronephrosis) was kinked and compressed by an aberrant vein which was surrounded by dense fibrous adhesions extending from the kidney capsule. Both capsules were much thickened and presented the appearance of a peculiar fibrous tissue. As it was stripped off, it left a bleeding surface. The capsule had doubtless contracted, for the kidneys bulged as the enveloping membrane was partially removed.

Since the operation, the patient has felt complete relief for the first time in two years, and he is now enjoying perfect health and comfort.

APPENDECTOMY: RESECTION OF PERFORATED ILEUM: LATERAL ANASTOMOSIS

Dr. Syms presented a man, forty-two years old, a printer, who was admitted to the Lebanon Hospital on January 4, 1914. His family history was negative, with the exception of the fact that his father died of tuberculosis. The patient had typhoid fever five years ago.

Present illness: Four days before his admission to the hospital the patient had an attack of abdominal pain, with fever, and was confined to bed. His pain, which was generalized, steadily grew worse, and he was sent to the hospital. His bowels were markedly constipated. He stated that about six months ago he had suffered from a similar attack. At that time the pain was localized in the epigastric region and lasted a few days. There was no vomiting. He also gave a history of several similar but milder attacks during the past few years.

On admission, there was tenderness over the abdomen, with marked rigidity on both sides. His temperature was 103°, but soon fell to normal. His pulse was 80. A blood count showed 12,000 white cells, with 77 per cent. of polynuclears; lymphocytes, 21 per cent.; mononuclears, 2 per cent. The stomach contents showed hyperacidity.

When Dr. Syms first saw the patient, his condition suggested a partial mechanical obstruction of the bowels rather than an acute appendicitis or peritonitis. His abdomen was tympanitic, and so distended that it was impossible to make a satisfactory examination. He was kept

under careful observation, and the bowels were slowly relieved by repeated enemata. When the distention had subsided, one could make out a tender, movable mass, which was apparently the appendix, adherent to the cæcum.

Operation: As the case was one requiring exploration, Dr. Syms made a free right rectus incision, encountering numerous adhesions which showed evidence of both recent and chronic inflammation. The appendix, which was bound down toward the pelvis, was deeply imbedded in adhesions. These were very dense, binding the cæcum down in an abnormally low position, enough to cause constipation. The omentum was also involved in these adhesions. The adhesions were divided, the cæcum liberated, and the appendix removed with ligature and cautery.

The most interesting feature of this case, Dr. Syms said, was the fact that near the terminal end of the ileum he found an inflammatory mass consisting of two adherent coils of small intestine which were wrapped up in omentum and intimately joined together by organized adhesions. Stripping off and resecting the omentum disclosed what appeared like a spontaneously formed anastomosis between these two coils of intestine, situated about three inches from the terminal end of the ileum. There was pus in the mesentery of the lower coil. This portion of the ileum was resected, together with its mesentery, the ends of the bowel were closed, and the continuity re-established by making a side-to-side anastomosis.

Upon opening the specimen of resected intestine, it was found that there was a small, round perforation into the intestine, with no apparent ulceration. The pathogenesis of this lesion could not be surmised: was it an abscess caused by a perforation of the bowel, or was it a perforation caused by an absence of the mesentery opening into the bowel?

The patient made a satisfactory recovery, and to-day, ten weeks after the operation, he was in better health than he had been for years.

INTUSSUSCEPTION OF THE APPENDIX

Dr. A. V. Moschcowitz presented a boy, ten years old, who was admitted to the Mt. Sinai Hospital on December 4, 1913, with the history that for years he had suffered from cramp-like pains in the abdomen. These were paroxysmal in character, persisting a few hours, and during the intervals he felt perfectly well.

Two days prior to his admission he was seized with this cramp-like pain in the abdomen. This attack, however, unlike the previous ones, persisted, and soon became localized in the right iliac fossa.

Upon examination, there was found a small, hard and but very slightly movable mass in the right iliac fossa, which was extremely painful and tender. The case was regarded as one of acute appendicitis, and an immediate operation was done. At first, no appendix was found, but further search revealed about one centimetre of the appendix protruding from the cæcum. The condition was recognized as an intussusception of the appendix, which was finally disinvaginated with some difficulty and removed in the usual manner. The boy's recovery was uneventful. The appendix was about three inches long, and showed a necrosis of the mucosa and œdema of all its coats.

In an article published in the *N. Y. Medical Record,* December 17, 1910, Dr. Moschcowitz said he collected all the cases of intussusception of the appendix then on record, numbering 24, to which he then had added one case of his own. Unless other cases had been published in the meantime, the case shown to-night would be the twenty-sixth. In the article referred to, he had entered at some detail into the pathology of the condition, and described the three varieties or degrees that had been observed. The case shown to-night belonged to that variety in which the intussusception began at the junction of the appendix and cæcum: more and more of the appendix became inverted, until the process was checked by swelling of the coats or by adhesions between the apposed serous surfaces.

Dr. Frank S. Mathews recalled a case of intussusception of the appendix in a child of five years, where about an inch of the appendix protruded and a mass could be felt within the cæcum. The area of the gut surrounding this mass was œdematous. The history, which dated back ten days, was that the child had suffered frequent attacks of colic, with slight temperature elevation. There was no tenderness nor rigidity, but upon physical examination a very definite lump could be made out in the appendicular region.

Dr. Howard Lilienthal said the late Dr. Edebohls, about seventeen years ago, suggested that such an invagination of the appendix should be deliberately produced instead of doing an appendectomy, and that Dr. Edebohls carried out that method in a number of cases.

Dr. Robert T. Morris said one reason Dr. Edebohls' method did not become popular was that the appendix often sloughed.

Dr. Mathews said that in cases of ordinary intussusception of the bowel in children, the base of the appendix sometimes formed the apex of the intussuscepted gut.

Dr. Moschcowitz, in closing, said he was also of the opinion that the three varieties of intussusception of the appendix that he had

described simply represented the same condition in different stages of its development, and that the case he had shown to-night was an example of an intermediate stage. In this connection, he recalled a case reported by Dr. George E. Brewer of this city, where the patient had been twice operated on for supposed appendicitis, and where no appendix could be found. At a third operation, Dr. Brewer found one of these cases of intussusception, with the appendix concealed within the gut.

PROLAPSE OF THE RECTUM: MOSCHCOWITZ OPERATION

Dr. James I. Russell presented a Russian carpenter, aged twenty-nine, who was admitted to Dr. Brewer's service at the Roosevelt Hospital on October 27, 1913, with the history that for the preceding eighteen months he had suffered from a prolapse of the rectum which had increased rapidly in size during the last two months. The condition had not interfered with his work, and while it had caused him considerable discomfort, there was no real pain. He was able to protrude the rectum at will, and the mass had always been reducible.

Upon examination, the protruded rectum measured two and a half inches in length upon the anterior surface, and about three and a half inches upon the posterior surface. The mucous surface was somewhat congested, but not eroded.

Three days after admission, under ether anæsthesia, the Moschcowitz operation was done. The abdominal wound healed kindly, and the patient left the hospital on November 28, 1913, four weeks after the operation. At that time there was a very slight rolling out of the anal mucous membrane upon straining. Five months had now elapsed since the operation, and inspection at the present time showed that the rectum still prolapsed about ½ inch when the patient forced it down.

Dr. John A. Hartwell said that Dr. J. P. Hoguet, assisted by himself, had performed this operation on a child about eight months ago. The patient was a poorly nourished Italian infant, with an osteomyelitis of the tibia, and after various conservative methods for reducing the prolapse of the rectum had been unsuccessfully tried, this operation was done, with very satisfactory results, and, up to the present time, there were no signs of a recurrence. The condition found at operation showed the prolapse to be of the whole rectal wall, that is, a true hernia and not simply a prolapse of the mucosa.

Dr. Lilienthal said he had watched the development of this operation in the hands of Dr. Moschcowitz, and he had no hesitation in stating that in adults, at any rate, the method was a very sensible one

and the results were very satisfactory. In children with prolapse of the rectum he thought that an operation was seldom, if ever, necessary. In young patients, by the strapping method, holding the buttocks firmly together, he had thus far never failed to effect a cure.

Dr. William C. Lusk, speaking of the possibility of treating some cases of rectal prolapse successfully without operation, said that he had once seen a complete rectal prolapse protruding about 3 inches through relaxed sphincters, in an insane patient who was luetic and greatly emaciated. The patient was too weak to operate upon and was put upon mixed treatment and a nourishing diet. He soon put on weight and when next observed, 4 or 5 months later, had become quite stout, the buttocks had become rounded, the ischiorectal fossæ had filled out with fat and the prolapsed bowel had gone back into place and remained there.

Dr. Kammerer said he was inclined to agree with Dr. Lilienthal that in children suffering from this condition, an operation was rarely necessary. At least, none should be advised until other methods had failed, especially if we succeeded in removing other predisposing factors.

The speaker said that, about a year ago, when Dr. Moschcowitz presented some excellent results obtained by this operation, he (Dr. Kammerer) mentioned a case of his own where he had done several other operations in a very aggravated case of prolapse, and these failing, he had finally resorted to the method under consideration. In this case, after six months, however, there was a recurrence of the prolapse.

Dr. Hartwell said he also agreed with Dr. Lilienthal that it was usually unnecessary to operate for this condition in children. At Bellevue Hospital they had a large number of these cases in young patients, and they usually got well without an operation. The case he mentioned, however, was an exception, in which all the conservative measures had failed.

Dr. Moschcowitz was of the opinion that the case shown by Dr. Russell was by no means cured. All the cases operated by this method—which went by his name—were not cured, and perhaps the main point in its value lay in the fact that it was a step in the right direction in explaining the pathogenesis of prolapse of the rectum. This form of prolapse was really a hernia, and by this method we obliterated the cul-de-sac of Douglas. The speaker said that not all of his cases had been cured by this method. In most of them the patients themselves were well pleased by the result, but not always the surgeon.

In children, what was often regarded as a prolapse of the rectum was simply a prolapse of the mucous membrane of the anus. The latter could be cured by almost any method, but a true prolapse of the rectum almost invariably required an operation.

ACUTE ILEUS FOLLOWING GASTRO-ENTEROSTOMY FOR DUODENAL ULCER

DR. RUSSELL presented a man, twenty-nine years old, who was admitted to Dr. Brewer's service at the Roosevelt Hospital on March 30, 1913, complaining of pain in the right upper quadrant of the abdomen. His history dated back twelve years, when he began to have griping pains, intermittent in character, in the right, upper quadrant, coming on ten or fifteen minutes after the ingestion of food and lasting from one to three hours. There was no history of vomiting excepting when it was self-induced for the relief of pain. For ten years, until two years ago, he would enjoy intervals of from one to three months, when he would be entirely free from symptoms. During the past two years the pain had increased in severity. There was no history of blood in the vomitus or stools. He had lost 20 pounds in weight during the past few years. He was always hungry, but afraid to eat. He denied gonorrhœa and syphilis, and there was no record of any other illness. For the past five years he had taken no alcohol.

At the time of his admission to the hospital the patient was poorly nourished. Physical examination was negative excepting for slight tenderness over the appendix and in the region of the duodenum. The bismuth X-ray plates were suggestive, but not positive for ulcer. A gastric analysis showed free hydrochloric acid, 44.5; total acidity, 72; no blood; no lactic acid. The stools were negative for blood.

Operation, April 2, 1913: After removing the appendix, which showed evidences of chronic inflammation, through an intermuscular incision, Dr. Russell exposed the upper quadrant of the abdomen through a median cut, and found a small ulcer on the anterior surface of the duodenum. A short-loop, posterior gastro-enterostomy was then done by the suture method, not excluding the pylorus. On the first and second days after the operation the patient vomited once, while on the third, fourth and fifth days he vomited several times. On the sixth day he was worse, and his condition becoming serious, the median wound was re-opened under light anæsthesia and the anastomosis inspected. The jejunum was found to be sharply angulated upon itself at the point of the anastomosis, causing a complete obstruction. An entero-enteros-

tomy was done with a Murphy button between the proximal and distal limbs of the jejunum. There was no further vomiting after this operation. Feeding was begun almost immediately on account of his starved condition, and he gained rapidly in health and strength. A year had now elapsed since the last operation. The patient had remained entirely free from his former symptoms; he eats whatever he likes and had gained considerable in weight, 25 pounds.

Dr. John F. Erdmann said it would be rather interesting to know the number of times that acute gastric dilatation occurred after gastro-enterostomy. In almost every one of his recent cases he had been obliged to resort to lavage of the stomach. In two cases several years ago where he re-opened the abdomen, thinking he had to deal with a vicious loop, he found a condition similar to that described by Dr. Russell. Both of those patients had no difficulty whatever with their loop, and after doing an entero-enterostomy the vomiting still persisted. He then put them on semisolid food, with a prompt abatement of the vomiting. In dealing with such cases now it was his practice to wash out the stomach and put them on semisolid food on the fourth or fifth day. He attributed the vomiting in these cases to acute gastric dilatation, and suggested that possibly that condition might have been responsible for the symptoms in the case shown by Dr. Russell.

Dr. Lilienthal thought that perhaps the length of the stoma was responsible for the symptoms in Dr. Russell's case. The speaker said that in one of his own cases, after gastro-enterostomy, he had found that the stoma was too long, producing an actual prolapse of the intestinal wall into the stomach and giving rise to a vicious circle.

Dr. Kammerer said he did not quite understand how a prolapse into the stomach of the wall of the intestine opposite the gastro-enterostomy opening could ever occlude the latter. This almost seemed to him a mechanical impossibility, as the pressure of the contents of the stomach upon the prolapsed wall would tend to reduce the latter to its normal position.

MUSCULOSPIRAL PARALYSIS FOLLOWING FRACTURE OF THE HUMERUS

Dr. Arthur S. Vosburgh presented a man, fifty-three years old, who, in September, 1912, sustained a fracture of the humerus at the junction of the upper and middle thirds, compounded from without by a small, punctured wound, not over the line of the fracture. The X-ray showed a transverse fracture through the shaft, with but slight dis-

placement of the fragments. He was treated by coaptation splints and a plaster cap to the shoulder and arm. After nine days he was discharged from the hospital and directed to report at the clinic for observation.

He was re-admitted to the hospital on December 30, 1912, it having been discovered on removal of the dressings that he had wrist-drop, with anæsthesia over the posterior surface of the forearm and hand. No mention of this condition had been made in his previous history.

Operation: On January 13, 1913, Dr. Vosburgh exposed the musculospiral nerve, which was found firmly bound down in the fibrous tissue about the site of the old fracture, but not involved in the callus. The continuity of the sheath was not destroyed, but the nerve had undergone a compression to the extent of half an inch. No scar tissue could be made out in this section of the sheath, and it was decided not to divide and resuture the nerve.

Restoration of function was now almost complete, with the exception of slight weakness in the muscles. In view of the total paralysis existing at the time of the operation this was encouraging.

The speaker said that Dr. Alfred Taylor had pointed out that where a nerve had been traumatized, the scar tissue that formed in the sheath at the site of the injury often prevented the regeneration of the nerve along its course.

Owing to the rather slow restoration of function in this case, Dr. Vosburgh thought it might have been a better procedure to have divided the nerve and resutured it.

Dr. Kammerer said that some years ago he showed a case where, after a backward dislocation of the elbow which was twice reduced, there was a gradual but complete paralysis with subsequent atrophy of the muscles supplied by the ulnar nerve. After six months, the speaker said, he cut down on this nerve, exposing it for a distance of about six inches, and found nothing abnormal, excepting, perhaps, at one point, where there seemed to be a slight constriction by a band of connective tissue. This was divided and, following this operation, immediate improvement began, which went on to perfect recovery.

Dr. Kammerer thought the question of a lesion of the musculospiral nerve after fracture of the humerus was a very important one. In the case shown by Dr. Vosburgh the outlook for complete restoration of function seemed very favorable. The return of motion was of course slow, and there were cases on record where more than a year had elapsed before any improvement was noticed.

FRACTURE OF THE ANATOMICAL NECK OF THE HUMERUS ASSOCIATED WITH SUBGLENOID DISLOCATION

DR. BENJAMIN T. TILTON presented an Italian, forty-five years old, who four months prior to his admission to the hospital fell a distance of four feet, striking on the palm of his outstretched left hand. Immediately following this accident he was treated in another city, the injury being regarded as one of fracture of the upper end of the humerus.

Since the accident he had suffered from marked disability of the arm and shoulder, and when Dr. Tilton saw him, three weeks ago, there was œdema of the hand and forearm, and a noticeable flattening of the shoulder. He was unable to place the hand on the opposite shoulder, and all movements were much restricted. In the axilla the rounded surface of the head of the humerus could be felt, which did not move on rotating the arm. The diagnosis of a subglenoid dislocation of the separated head was confirmed by an X-ray picture.

Three weeks ago an operation was done for the purpose of removing the detached head of the humerus. On account of its location, deep in the axilla, an incision was made in this region, exposing the articular surface. This, after considerable difficulty, was freed from the surrounding soft parts, and its detachment from the shaft was accomplished by grasping the head with a lion-jawed forceps and rotating it. One of the tendons attached to the greater tuberosity resisted traction and had to be divided with scissors after an anterior incision between the deltoid and the pectoralis major muscles. The hemorrhage was not serious and both wounds healed without incident.

The patient had already begun to show marked improvement in the function of the arm. The œdema due to pressure of the head upon the veins in the axilla had almost entirely disappeared, and there was no more pain. The fragment removed showed a clean fracture through the anatomical neck.

DR. LILIENTHAL said that a few years ago he had an unfortunate experience with a case of fracture through the anatomical neck of the humerus, with dislocation, in which the lesion was almost exactly like the one in the case presented by Dr. Tilton. The loosened head of the bone had become displaced down to the edge of the pectoralis muscle, far away from its normal position, and the case was of particular interest because it eventually led to a lawsuit. The patient was a man who had sustained an accident in Omaha, where a physician told him he had sustained a dislocation of the shoulder, which he proceeded to

reduce by placing his booted foot in the axilla, and then applied a Velpeau bandage.

When the patient subsequently consulted Dr. Lilienthal, the latter refused to examine him until an X-ray was taken, which showed the true condition, and the patient was then told that the head of the bone should be removed. To accomplish this an incision was made along the border of the pectoralis and the loose head of the bone was removed. On the following day the patient was unable to use the hand, and he subsequently brought suit against Dr. Lilienthal for $50,000, claiming that in the course of the operation, while attempting to secure a bleeding vessel, he had crushed and injured a nerve irreparably. When the case came to trial, two years later, the functions of the arm had been restored, and the man was entirely well. Dr. Lilienthal stated that he believed no plastic operation could have produced such a perfect result.

CICATRICIAL STENOSIS OF THE PYLORUS: POSTERIOR GASTRO-ENTEROSTOMY

DR. TILTON presented a man of forty, a laborer, who had suffered for fifteen years from gastric disturbance, consisting chiefly of epigastric distress, pyrosis and vomiting. The pain usually came on from half an hour to two hours after eating. During the past year the symptoms had become more or less constant and more severe, and he had been unable to retain any solid food in the stomach, with consequent loss in weight and strength. The vomited material was considerable in amount and had a peculiar foul odor. The microscopic examination of the vomitus showed starch, fat, muscle fibre, vegetable cells and sarcinæ ventriculi. Chemical analysis showed a total acidity of 90; free hydrochloric acid 54, and impaired starch digestion. The motility tests showed a marked impairment and considerable stasis.

A diagnosis of pyloric obstruction of a benign character was made and operation revealed a marked thickening in the pyloric region with dense adhesions. The stomach was greatly dilated. A posterior no-loop gastro-enterostomy with clamps was done. Since this operation, which was done three weeks ago, the patient had not vomited, and had shown a steady gain in weight.

Dr. Tilton said this patient was shown mainly in the hope of bringing out a discussion as to the choice of operative procedure between a pylorectomy and gastro-enterostomy in these cases. To the speaker it seemed that in the absence of any signs of malignancy, a gastro-enterostomy was preferable, as it was by far the safer procedure and uniformly gave good results in this class of cases. Should symptoms

of beginning carcinoma develop, a subsequent pylorectomy could always be done, providing the patient was kept under observation. This had become necessary in only one of the speaker's cases.

DR. LILIENTHAL said that in dealing with these cases he was strongly in favor of doing a preliminary gastro-enterostomy, either through the median line or to the left of the median line, and making a careful examination of the pyloric region, using rubber gloves and putting no gauze in the abdomen. Then, after an interval of two or three weeks, the pylorus should be removed. By that time the tumor would be much smaller and he could recall cases in which inflammatory growths the size of a duck's egg had disappeared spontaneously. By doing an additional pylorectomy we obviated the possibility of subsequent cancerous degeneration, and by doing the operation in two stages the mortality was largely reduced.

DR. KAMMERER said he was not quite in accord with Dr. Lilienthal on the question of doing a primary gastro-enterostomy. He also could recall cases where inflammatory tumors had disappeared spontaneously after gastro-enterostomy in a few weeks. If we could differentiate an inflammatory thickening of the pylorus from a malignant growth at operation the two-stage procedure might be of advantage in cases of benign obstruction. He believed, however, when possible, a complete operation should be done in one sitting in cases of carcinoma of the pylorus, as he had become convinced on several occasions that a secondary resection might present additional difficulties.

ONE HUNDRED AND TEN CONSECUTIVE CASES OF APPENDICITIS WITHOUT MORTALITY

DR. WILLIAM B. BRINSMADE read a paper with the above title, for which see page 610.

DR. ROBERT T. MORRIS said the statistics given by Dr. Brinsmade spoke for themselves and needed no comment. As late as 1904, in an article entitled "A Consideration of the Question of Drainage in Cases of Acute Appendicitis with Spreading Peritonitis," which was published in *The Medical News* (July 2, 1904), Dr. L. W. Hotchkiss reviewed the work in this field of surgery in one of the hospitals in this city. His results were interesting. Up to the year 1898 appendicitis statistics showed a mortality of 31 per cent. After changing to methods which he had previously considered to be dangerous, in the same institution and with cases of practically the same character as those submitted to operation during the earlier period, he had an unbroken series of 72 cases with no mortality. Those figures were a fair representa-

tion of our results in this field of surgery when changing from the principles of the third to the fourth era. Part of the work of Dr. Brinsmade still related to the third or pathological era from which we are now emerging into the fourth or physiological era.

In the line of suggestion rather than criticism, which in the face of Dr. Brinsmade's results was unwarranted, Dr. Morris said he did not think it was essential in dealing with a gangrenous appendix to make any great effort in the care of the stump. It could be neglected and left to take care of itself, nor did he think it necessary to isolate the peritoneum with pads. If, broadly speaking, we had less dread of the pus encountered in these cases and looked upon it almost in the light of an albuminous, nourishing fluid, frequently sterile, we would less often inflict unnecessary trauma in trying to get rid of it, and our results in the end would be better. With a small incision, rapid work, and as little manipulation as possible, even such splendid results as those reported by Dr. Brinsmade might be eclipsed.

Dr. Erdmann said that in cases of ruptured appendiceal abscess, recent investigations that had been carried on with the peritoneal content outside the abscess area indicated that the bacilli were usually restricted to those coils in immediate proximity to the abscess.

Dr. John A. Hartwell said he felt that the intra-abdominal pressure was a very active agent in preventing the spread of pus from an abscess into the general peritoneum. If the abscess were carefully opened on the side toward the peritoneal incision the pus would flow in that direction and pads were not needed to prevent its dissemination. This did not apply when the abscess was completely localized in the peritoneal cavity, but not close to the anterior abdominal wall.

Dr. Kammerer said that in some cases of appendicitis where a large abscess had been opened, it was difficult to locate the appendix and, on this account, inadvisable to make a search for the same in dense infiltrations. He had been struck by the ease with which the appendix could very often be reached at a later operation and removed, when the acute inflammatory conditions had subsided. An appendix, which at the first operation seemed to lie deep in the pelvis, would at the secondary operation be found immediately beneath the abdominal walls.

Dr. Moschcowitz said that at Mt. Sinai Hospital during the past fifteen years they had taken cultures in every case of appendicitis. During some of these years they had operated on between 700 and 800 cases of appendicitis, and in most of these cases cultures were made, and so regularly had they received the report that one or the other of the pathologic bacteria were present that when they occasionally did

receive a report that the secretion was found sterile, they were inclined to attribute it to some error in the technic of taking the culture.

Dr. Eugene H. Pool said that in cases where fluid was present in the pelvis Dr. Brinsmade introduced two large retractors and attempted to get rid of the pus by turning the patient on his side to allow the fluid to run out. In preference to this method, if it was considered advisable to evacuate the pelvis, it seemed to the speaker more reliable and thorough to employ the suction apparatus, developed some years ago at the New York Hospital. By this method accumulations of fluid in the pelvis or elsewhere in the abdomen could be quickly removed with a minimum degree of trauma; the method eliminates the necessity for sponging with gauze, moreover, there is no danger of injuring the viscera. The last feature, Dr. Pool said, should be emphasized because the somewhat limited adoption of the method appeared to be due to a failure on the part of many surgeons to appreciate that a properly constructed suction tip can be passed into the abdominal cavity without cupping or sucking the intestines or omentum. The features of the tip, which goes by his name, have been described in several articles, the most recent being Annals of Surgery, vol. lviii, 1913, p. 537.

Dr. Syms said that a few years ago such a report as the one made by Doctor Brinsmade would have been impossible.

When Ochsner proposed his method of treatment he based his reason for it on evidence which he had gleaned from the statistics obtained from a number of prominent surgeons. According to him, these statistics showed that the mortality following operations for appendicitis ranged from 15 to 30 per cent. in acute cases, and he laid down the rule that one should not operate in acute cases unless he could operate within the first thirty-six hours. He believed operation after that period to be excessively dangerous and he advised waiting until the patient had passed through that attack and could be operated on in the interval.

Dr. Syms said that in his experience he had never had such a large mortality as that stated by Ochsner, that he had not had a high mortality in acute cases except in those cases in which there were no protecting adhesions and in which there was a spreading or general septic peritonitis. In former years this latter type of cases had shown a high mortality. But in acute cases with a localized process his deaths had been very few.

Recently he had published a paper setting forth an analysis of his work, comparing three different periods. His work at Lebanon Hospital formed the basis of these reports. For this purpose he had divided his cases into three different classes, first, the chronic or inter-

val cases; second, the acute cases with limiting adhesions; and third, the acute cases without limiting adhesions but with spreading or general peritonitis. His results in the first two groups of cases have always been good. In the third class of cases, years ago the mortality was high, practically 100 per cent. To-day the mortality is low, most of the cases being saved. Dr. Syms had always followed the rule of operating as soon as possible. Formerly he used to attempt to cleanse the peritoneal cavity by sponging, flushing, etc. Of late years he does nothing of the sort but operates as rapidly as possible, removing the appendix and introducing drainage. Occasionally he employs suction, using a Pool tube, but he does not employ this as a routine. His whole idea is to remove the appendix as rapidly as possible, inflicting the least possible amount of traumatism. To this plan of treatment Dr. Syms ascribed the reduction in the mortality rate in this class of cases. Bacteriologically he had not been able to verify the findings of Dudgeon and Sargent. He had not found dual organisms in his cases—simply one variety of bacterium being demonstrated as a rule.

TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting, held April 6, 1914

DR. JOHN H. GIBBON, President, in the Chair

SPRENGEL'S DEFORMITY OF THE SHOULDER

DR. J. TORRANCE RUGH presented a boy, four years of age, one of a family of four children. The other three were normal. This boy when two years old was noticed to hold the left shoulder higher than the right but, never having complained of any pain, nothing was done until a short time ago. He first came to the Orthopædic Dispensary of the Methodist Hospital in March, 1914, and examination showed an undersized child of rather inferior mentality. The left shoulder was carried nearly an inch higher than the right, the normal curve of the neck on that side was much altered, giving the appearance of a short neck. The scapula was raised and tilted forward and could not be moved up and down. There was inability to raise the arm above the shoulder level or backward as freely as the right, but other movements were normal. Palpation showed a mass anterior and superior to the scapula which moved with the scapula. The posterior-superior angle also appeared fixed, so that scapular movement occurred about this point as a pivot. The spine appeared slightly deviated to the left side in the upper dorsal region, but was not fixed. The chest anteriorly showed prominence of the upper ribs to the right of the sternum, while the left side showed some flattening as in cases of left dorsal rotation of the spine. No other abnormalities were present in the body. A diagnosis of congenital elevation of the scapula (Sprengel's deformity) was made and a röntgenogram was ordered (Fig. 1). This apparently showed a bony formation running from near the coracoid process upward into the neck, which was the mass to be felt by the fingers. It was thought at this time that this bony formation was the cause of the deformity.

Later, operation was performed, on April 28, 1914, at the Methodist Hospital. The bony mass was found to be a hooked scapula (upper border) which lay close to the deep neck muscles and quite high up. This upper edge was removed with forceps but the shoulder could not be brought down for any distance. The posterior-superior angle was

FIG. 1.

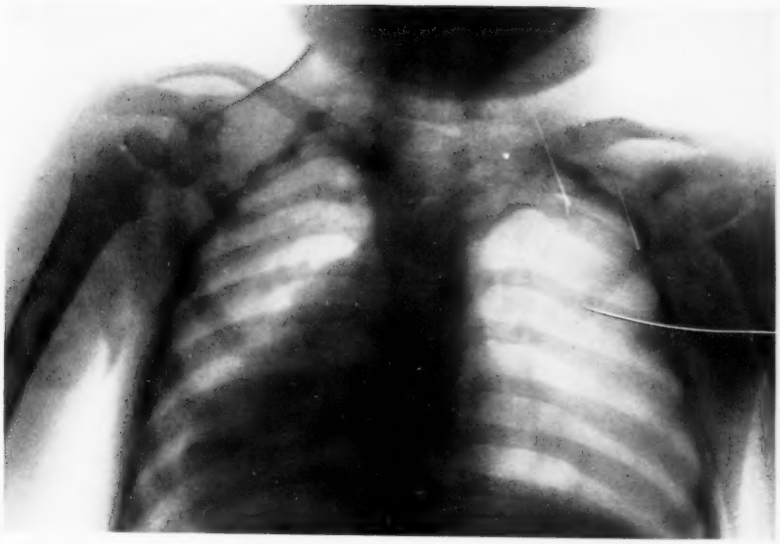

FIG. 2.

FIGS. 1 and 2.—Sprengel's deformity of the shoulder.

then exposed by direct incision, and a distinct articulation was found to exist between that point and the tip of the seventh cervical spine. This latter was greatly elongated and turned to the left side as though it had been pulled over by the scapula. The röntgenogram also shows twisting of the lower part of the cervical spine to the left side and this accounts for the prominence of the anterior right ribs. Three-fourths inch of the spinous process was excised and the scapula freed from attachments. It was then easily pulled down to a level with its fellow. The incisions were closed with catgut and broad straps of adhesive plaster were used to pull the shoulder well down on the chest wall. Recovery was uneventful and a röntgenogram taken showed a quadrangular-shaped scapula lying in practically the same relation as its fellow (Fig. 2).

Dr. Rugh also showed a case of a boy of five years of age who had received repeated injuries to the right shoulder. Marked enlargement of the upper end of the humerus resulted, with more or less limitation of function, but practically no pain. The diagnosis lay between exuberant callus (from possible fracture), a bone cyst and sarcoma, and the opinion of the Fellows of the Academy was asked regarding it. Röntgenograms taken at different periods were also shown.

It was the opinion of the Fellows that the case was one of bone cyst.

Dr. John H. Gibbon, apropos to the Sprengel's deformity case, presented an X-ray plate of a child operated on by him a year ago, in which there was found a narrow band of bone running from the base of the spine of the scapula to the transverse process of a cervical vertebra. This bone was excised. An interesting point in this case is the cleft cervical vertebræ plainly shown in the plate.

Dr. Astley P. C. Ashhurst said that Dr. Gibbon's mention of the cleft cervical vertebræ reminded him of a specimen recently secured from an adult cadaver by a student at the University of Pennsylvania: in this the vertebræ were cleft and there was a bony mass running from the vertebræ over toward the scapula. Evidently no treatment had been required.

Regarding Dr. Rugh's second case he considered it a bone cyst, and that operation is indicated for removal of its contents, and partial obliteration of the cavity by crushing its walls.

TRAUMATIC DISLOCATION OF THE HIP

Dr. Carl R. Steinke (by invitation) presented a paper with this title, for which see page 617.

Dr. P. G. Skillern, Jr., said that before a traumatic luxation can

be spoken of, there are two postulates that must be fulfilled. These are that the capsule must be torn and the articular surfaces separated from each other. In the "central luxation of the hip," referred to by Dr. Steinke, neither of these postulates is fulfilled. The capsule is telescoped, and the articular surfaces usually remain in contact. The correct term to apply to this injury is "perforating fracture of the acetabulum," and if the head of the femur has entered the pelvic cavity, "perforated fracture." The presence of the femoral caput in the pelvis is merely incidental, it being jammed in *after* the fracture of the acetabulum.

Dr. Henry R. Wharton remarked that dislocation of the hip is very rare in children, and he could only recall one case in his experience, which occurred in a child about ten years of age from a heavy body falling upon him, resulting in a posterior dislocation of the hip. A complicated dislocation of the hip was brought to the Presbyterian Hospital; the patient was said to have a dislocation of the hip; attempts at reduction were made but the reduction could not be maintained. Examination revealed posterior dislocation with fracture of posterior lip of the acetabulum. In this case he succeeded in getting reduction and then maintained it by putting the patient up in plaster of Paris, with the thigh abducted, while still under the anæsthetic. The patient made a good recovery.

Dr. Gwilym G. Davis thought that traumatic luxations of the hip are so infrequent that it is a wise thing to record individual cases, particularly as regards the difficulties which are experienced in handling them. One of the cases which was mentioned by the reader, of dorsal luxation, came to the hospital while he happened to be there, and therefore it devolved upon him to look after it; otherwise the resident might have been the only one to have observed it, the chief frequently failing to see luxations, particularly if of the type which is easily reduced. He, therefore, in this case, allowed the house officer to attempt the reduction with the patient on his back, under an anæsthetic. It failed. Then the patient was brought to the end of the bed, which was an iron bed without a footpiece, and allowed the limbs from the hips out to extend beyond the end of the bed. The uninjured limb was held horizontally by one assistant and the other assistant was directed to flex the affected thigh at a right angle to the body and the knee at a right angle to the thigh; the body then was horizontal, the thigh vertical, and the leg horizontal. While one assistant pressed downward on the calf of the leg, a second assistant made pressure on the head and trochanter and it gently sank into its socket. That is the Stimson method and in that case it worked

beautifully. Attempts to reduce many luxations are at first unsuccessful on account of the resistance of the muscles; of course this does not apply so much in luxation of the hip where the patient is anæsthetized.

Allis should be given credit for the work which he has done in this line, and particularly for two things; it was he who said that the innominate bone had its anterior and posterior surfaces divided into 2 planes by a line running from the anterior superior spine of the ilium to the tuberosity of the ischium. He also proved the success of the direct method of reducing luxations. His direct method is in the first place to relax all the tissues as far as possible, and then pulling or pushing the head of the bone in the direction of the socket; it is surprising in how many cases this method of reduction will be successful without the employment of great violence.

When it comes to those cases in which difficulty is experienced the most common reason is because the luxation is complicated by fracture. In the present day with the X-ray this point is capable of diagnosis. On one occasion he was present during the attempted reduction of a supposed dislocation by several surgeons; it could not be satisfactorily accomplished and the case was later shown to have had a fracture of the edge of the acetabulum, so that the head would slip out as soon as replaced. When it comes to the shoulder-joint, the fracture will frequently occur close to the joint line and then the fracture and luxation will be confounded and mistaken, one for the other.

Dr. J. Torrance Rugh mentioned the case of a man who had been thrown downstairs. A dislocation of the hip was diagnosed and attempts made at reduction and a great deal of difficulty experienced in reducing it, but finally the head slipped into the acetabulum and the man was put in bed with extension and sand bags. At the end of about three weeks the head had apparently slipped out of the acetabulum. He was again anæsthetized and attempts at reduction were about to be made when suddenly the man became cyanosed and died. Post-mortem examination revealed that the dislocation had been reduced, and that there was a piece broken out of the neck of the femur and a large mass of muscle tissue interposed between this fragment and both ends of the bone from which it was broken, so that no crepitation was present and no fracture had been diagnosed. Death was due to a blood clot which became loosened in the femoral vein.

Some years ago he had a case of thyroid dislocation which was brought down from the coal regions about four or five weeks after the injury; it was supposed to be a fracture, but the X-ray showed it

to be a thyroid dislocation and, at that time, reduction by manipulation proved absolutely impossible, so by the open method the head was reduced and a good result secured.

CHRONIC CYSTIC MASTITIS

DR. GEORGE P. MÜLLER read a paper with the above title, for which see page 595.

DR. CHARLES H. FRAZIER said that Dr. Müller and he had been going over the results of this series, during the past year, and they had come to the conclusion, that in the future they would adopt the radical method rather than the conservation operation, that is, the complete removal and not the partial resection of the breast. He did not believe there will be much dissent on the part of surgeons as to the adoption of this general principle, though there may be some dispute as to whether the breast is removed subcutaneously with conservation of the nipple, or whether the breast together with the nipple is removed through an oval incision. As a matter of convenience the latter procedure will be preferred and may be in many respects the most satisfactory. As a general principle, the surgeon inclines to the operation which involves the least mutilation, and he had always thought, particularly where the breast on the other side was not very large, that the patient would be better satisfied if the nipple was not removed. For this reason in many of his cases the nipple has not been removed and a subcutaneous purse-string suture is introduced to prevent the nipple flattening out and becoming adherent to the chest wall. But in this connection it is interesting to hear that the patient who had the nipple conserved on one side and removed on the other preferred the latter procedure. While as a matter of routine frozen sections are made at the time of operation, the limited time afforded for the examination and the limited area of tissue investigated has led him to place little reliance upon the pathologist's report from the frozen section. If upon further study carcinoma is discovered, a secondary operation is performed for the removal of the pectoralis major and the other steps incident to a radical operation.

DR. J. S. RODMAN said that during the last five years he had seen a good many of these cases of chronic cystic mastitis, perhaps between 50 and 60. The recent paper by McCarty is exceedingly interesting from the pathological stand-point; its chief importance is perhaps to correlate the clinical results with laboratory findings as has been pointed out. In the series of cases which the speaker had seen at his father's clinic the majority of those presenting small shot-like cysts with inky black fluid proved to be the ones that were the most prone to undergo

malignant change. There have been 6 instances of double cystic mastitis where operation first on one side was done, the patient returning later for operation on the other gland.

There are one or two little points of interest in the diagnosis of this disease. The superficial veins of the breast are rather apt to be prominent, and there is apt to be considerable pain at various times, particularly at the menstrual periods, at which time the patient also complains that the breast appears to be larger than at other times. As to the treatment of chronic cystic mastitis, his father was now of the opinion that the best operation, particularly in women of the cancer age, is to do the complete operation for cancer. He feels that removal of the muscle makes so little difference to the patient that it should always be done. On the other hand, in very young women it is worth while to take a chance with the less complete operation, the resection being according to the plastic plan of Warren. As to the frozen section, they always use it and had come to depend a good deal on it, in spite of the fact that in three instances which he could recall the frozen section has been wrong. If the diagnosis of general cystic mastitis is returned, the gland is sacrificed, provided the woman is over thirty-five years of age.

Dr. George P. Müller (in closing) said that the 18 cases reported by him were diagnosed in the laboratory as chronic cystic mastitis and not as carcinoma with chronic cystic mastitis. They have had 40 or 50 cases during these 10 years which were diagnosed clinically as chronic cystic mastitis but in which the laboratory examination revealed carcinoma. These are filed under the cancers. In none of the cases traced has there been any development of cancer; there has been a recurrence of cystic nodules when partial resection had been done and some of these required a second operation. One cannot say in all cases of chronic cystic mastitis from the clinical examination alone whether carcinoma is or is not present. It can only be done by the most careful microscopic examination. Last year Syms reported, before the New York Academy of Surgery, a case operated on for chronic cystis mastitis but in which later examinations revealed carcinoma; Hartwell and Lee reported similar cases. For this reason he believed that complete amputation of the breast and a dissection of the axilla is indicated in all women over thirty years of age; in acute appendicitis we know that most of the patients will get over the attack under non-surgical treatment but we never know in the individual case before us whether he will get well or progress to gangrene, etc. It is so in chronic cystic mastitis; we do not know whether the breast contains cancer or not. He also wished to refer to the frequent criticisms of the laboratory diagnosis by sur-

geons of little pathologic experience. Microscopic diagnosis is not any more exact than a clinical diagnosis. It is a matter, to some extent, of personal equation or of the experience of the examiner, and while the pathologist makes less mistakes than the clinician, yet he is more frequently criticised than the latter.

INDICATIONS FOR AND VARIATIONS IN THE TECHNIC OF ECK FISTULA

DR. MAX M. PEET (by invitation) read a paper with the above title, for which see page 601.

DR. J. E. SWEET was somewhat inclined to disagree with Dr. Peet's view of von Eck's work; von Eck succeeded in having a dog live over a year, and that was 38 years ago.

The operation is perfectly feasible and the results are entirely compatible with life, except in one point; the animals he had had living a long period, the longest being 3½ years, died of evident cirrhosis of the liver. Nevertheless, the operation is indicated for cirrhosis of the liver; it is certain that there is no other definite relief for the back pressure in this condition. About a year ago last fall, he worked out on the cadaver a method of doing the Eck fistula, consisting in the anastomosis between some of the radices of the portal vein and the iliac, and found it was very easily accessible and easy of accomplishment. Thereupon, Dr. Edward Martin and he, in his service at Blockley, attempted it twice. It seemed that the indications were perfectly clear in each case; in the first they opened the abdomen supposedly for cirrhosis of the liver, but found this diagnosis to be incorrect, there being a condition of syphilis of the liver and spleen. The Talma operation was performed. In the second case they were unable to exactly determine the condition but it was also thought to be syphilis.

DR. CHARLES H. FRAZIER referred to his own experience with omentopexy. His first Talma operation was analogous in one respect to his first Edebohls's operation, both were suitable cases and in both the results were extraordinarily brilliant. The patient was a middle-aged man, alcoholic, with marked cirrhosis of the liver and with no organic changes in the kidney or heart. Although he had to be tapped two or three times after operation, from that time on for five years, when he lost track of him, the ascites did not return. He had performed the Talma operation on four or five cases since then, but in none of these did he now recall, has there been any striking relief for the condition for which the operation was performed.

With regard to the indications for, or the preference for, the Eck

fistula over the Talma operation, it seemed to him that in suitable cases they would be justified in recommending the Eck fistula, provided it can be done by those experienced in blood-vessel surgery. In the case of a young woman, from whom he had removed the spleen a year ago for Banti's disease and who had developed secondary changes in the liver with marked ascites, after careful consideration, they decided to make an Eck fistula, but at the operation the adhesions were so abundant and of such character, that they could not expose vessels suitable for anastomosis. As to the operation requiring the hands of a surgeon experienced in blood-vessel surgery, he had had the opportunity of assisting Dr. Peet several times in Eck fistula operations on animals and had been surprised to find with what facility the operation is performed by experienced hands. In the human subject as in dogs, it ought to be attended with no shock and with no infection. The operation is of short duration and the mortality should not be higher than that of the Talma operation, which necessitates so much intentional trauma of the peritoneum.

Dr. Astley P. C. Ashhurst asked if experimental surgeons have succeeded in producing ascites by obstruction of the portal vein. Theoretically, this will produce enlargement of the veins in its distribution on the mucous surfaces of the gastro-intestinal canal, but will not produce ascites. Hale White, Rolleston, A. O. J. Kelly and others have maintained that a patient with uncomplicated cirrhosis of the liver never lives long enough to be tapped more than once; in other cases the ascites may be due to changes in the peritoneum, perhaps tuberculous, or possibly syphilitic, or due to some other infection. Therefore, the establishment of an Eck's fistula seems an irrational procedure for the relief of ascites; and the relief of the ascites, which sometimes follows epiplopexy, probably is not due to the establishment of a collateral circulation, but to the trauma to the peritoneal surfaces which is an essential part of Talma's operation. The indication for the establishment of a collateral circulation is gastro-intestinal hemorrhages, and not ascites alone.

OSTITIS FIBROSA CYSTICA

Dr. L. H. Landon (by invitation) read a paper with the above title, for which see page 570.

Dr. Gwilym G. Davis said that once, years ago, he operated on one case of cyst of the lower end of the ulna by curetting and it has remained well. The subject is comparatively clear when there is a single cyst of the bone, but it becomes more obscure when it is one in which

the outlines are not so circumscribed and the tissues become, so to speak, rarefied; in other words, instead of being in two or three large vacuoles, there is a more disseminated rarefaction and also when it advances a little further and involves the outer edge with a possible involvement of the periosteum. Take the cases, for instance, of Paget's disease, of ostitis deformans. They seem to be closely allied to ostitis fibrosa. He remembered reading two or three years ago the report of an Italian case of Paget's disease limited to a single bone like the femur, and he thought, in Dr. Henry Ling Taylor's book on orthopædic surgery, there is an allusion to Paget's disease being limited to more or less distinct bones and not being a general affection. In such a case it would be pretty hard to make a diagnosis not as to the condition exactly, but to classify it; these cases seem to shade one into another all the way from the simple single cyst to the rarefaction of Paget's disease.

THYROID OPERATIONS AND HYPERTHYROIDISM

Dr. Charles H. Frazier read a paper with the above title, for which see page 583.

Dr. George P. Müller believed that too much emphasis is laid upon the preliminary medical treatment of exophthalmic goitre by most of the writers and text-books on the subject. It seemed to him that those cases seen early, before the so-called four cardinal symptoms are present, when mental irritability, general nervousness, loss of weight and strength and tachycardia may be the chief evidences of hyperthyroidism, may be completely cured by non-operative measures, of which rest is the key-note of treatment. In cases in which the diagnosis is established, it is an absolute waste of time in trying the so-called medical treatment for the three or four months advised by most writers.

BOOK REVIEWS

SURGERY OF THE VASCULAR SYSTEM. By B. M. BERNHEIM, Instructor in Surgery, Johns Hopkins University. 104 pages, 53 illustrations. Philadelphia: J. B. Lippincott Company, 1913.

The author's purpose to furnish for those interested in this branch of surgery a concise practical aid to both experimental and clinical applications of vascular operative technic has been well accomplished.

In the consideration of this subject chapters have been devoted to general technic, transfusion, end-to-end and lateral anastomosis, transplantation of segments, arterial and venous, reversal of the circulation for the prevention and treatment of gangrene, the treatment of varicose veins, surgery of the heart and aneurisms, and is concluded by an extremely valuable statistical study of aneurismal therapy. A careful study of this commendable monograph suggests but one criticism and one that is not easy to overcome. Every step advised in the text is of such actual consequence that it might be overlooked as unessential since all could not be emphasized. Anyone who has attempted to do this work or who has seen the work of those who have become proficient can realize and appreciate the excellent manner in which the technicalities have been presented. If there is one branch of surgery above all others in which a constancy of good results is dependent upon an irreproachable technic rather than upon a contest against time, it is in vascular surgery and only such as are willing to acquire and to preserve this rigid technic are justified morally in attempting its application to the human subject.

In addition to being an excellent and impartial summary of the work done by others there are presented very ingenious methods devised by the author, notably in transfusion and in the reversal of the circulation by means of a lateral rather than an end-to-end arteriovenous anastomosis. In a study of the treatment of aneurisms only the more acceptable methods are presented, the results of which are portrayed in the statistics contained in the last chapter.

The illustrations throughout are excellent and sufficiently numerous to make every important point certain of understanding. Altogether this book is not only instructive and suggestive, but also of distinct practical value.

J. L. YATES.

BLOOD PRESSURE IN MEDICINE AND SURGERY. By EDWARD H. GOODMAN, M.D., Associate in Medicine in the University of Pennsylvania. 12mo, 226 pages, illustrated. Philadelphia and New York: Lea and Febiger, 1914.

The author has succeeded in this work in putting before the practitioner of medicine and surgery a brief, clear and authoritative book on the subject of blood pressure. In it one finds the physics and physiology of the subject sufficiently elaborated to convey an understanding of the principles. This is followed by successive chapters devoted to hyper- and hypotension; blood pressure in cardiovascular, renal, infectious and nervous diseases. Chapters are also given on blood pressure phenomena in obstetrics and in surgery, as well as conditions arising from disturbances in the gastro-intestinal tract and the internal secretory glands. The monograph is closed with chapters on the effect of drugs and other therapeutic measures on blood pressure and on the treatment of hyper- and hypotension. The style is simple and direct and the introduction of many illustrative diagrams forms an important feature of the work.

JAMES T. PILCHER.

RADIUM AND RADIOTHERAPY. By WILLIAM S. NEWCOMET, M.D., Professor of Röntgenology and Radiology, Temple University, Medical Department. 12mo, 315 pages, with 71 illustrations and 1 plate. Philadelphia and New York: Lea and Febiger, 1914.

In view of the extraordinary interest which has developed lately in the subject of radio-active substances, it is of interest to have the present knowledge on the subject brought together under one cover. In this small volume the author has first considered the question of what radium actually is, its nature, physics and chemistry; while the second part of the book details its use in all the diseases in which it has been found of value and gives full directions for its application.

JAMES T. PILCHER.

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